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culture

SELECTED CONTENTS

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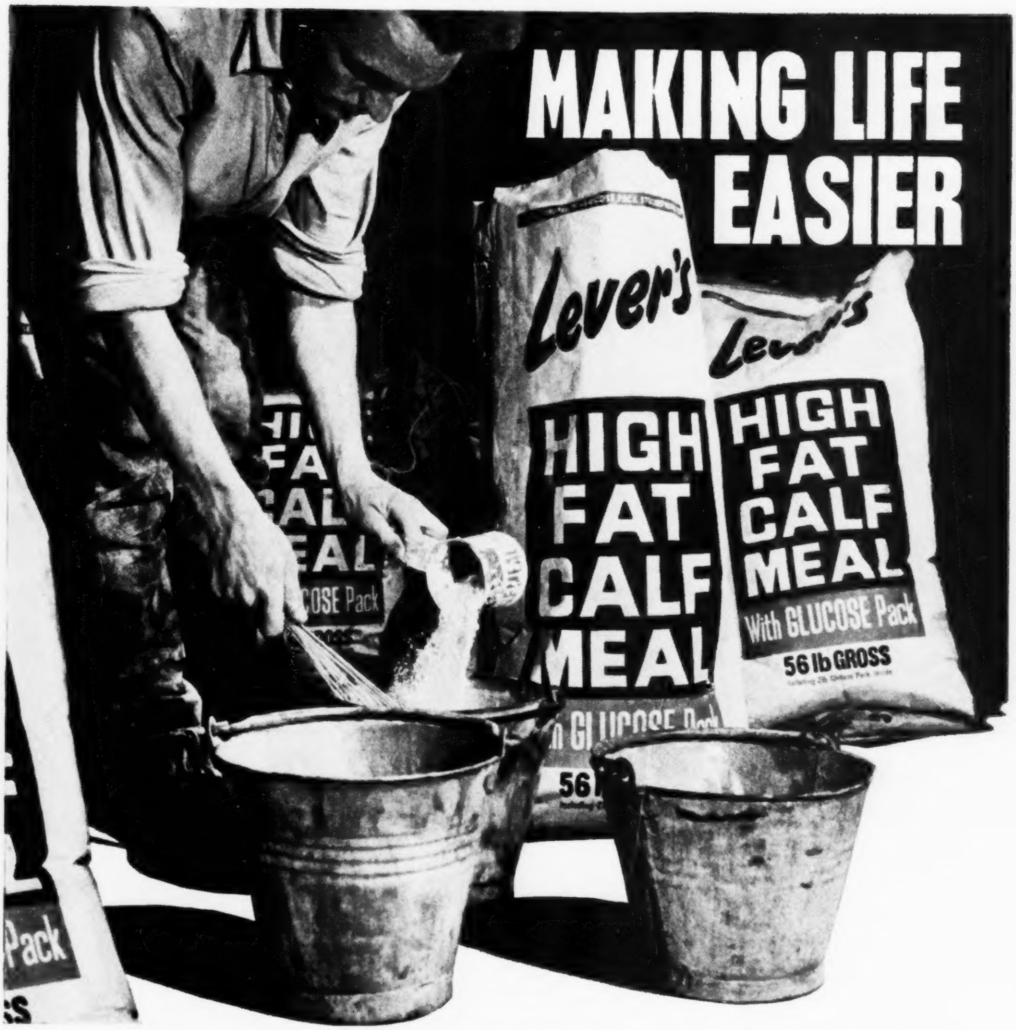

Of course he's a good stockman—but some things he can't control. Chilly weather and bacterial build-up with bought-in calves are two. So he takes no chances. He chooses Lever's High Fat Calf Meal. He finds he gets greater growth, less pneumonia, lower losses, less scouring. When friends tell him his calves' better bloom and extra flesh are a tribute to his skill, he credits Lever's too. Shows them how eagerly his youngsters take to it—and admits they need less looking after. Says he'd pay a premium just to make life so much easier—for his calves as well as himself—but his hidden wallet tells him he makes more on them as well. He knew he would when he read the evidence. Got it in a leaflet from his local Lever's man. Wouldn't you like to do the same?

FOR BETTER CALVES AND GREATER GAINS

FEED

Lever's

HIGH FAT CALF MEAL

With Glucose Pack

LLP 451

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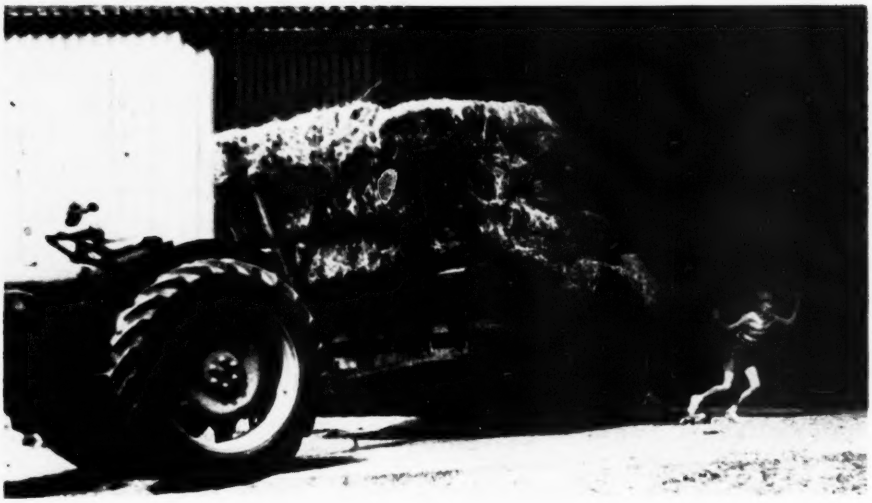


MIND THAT CHILD!

DURING the last four years sixty-four children have been killed on farms in England and Wales. Besides these fatalities, there have been many accidents to children which, though not resulting in death, have been serious enough. Recently a farmer hurried from the house, jumped on his tractor and drove off. In doing so, he ran over an infant who followed him. Another young child had her clothing caught by the moving parts of a machine and lost an arm. One child killed, another maimed for life! The farmer never thought to make sure that he had not been followed, and no one realized that the girl's clothing might get caught.

Children who have just learned to walk need watching all the time. The world is an exciting place and quite naturally they will explore any farm building that takes their fancy. Real danger lies for them in grain pits, ponds, uncovered cesspits and in the ever-increasing range of farm machinery. Chemicals must be stored where eager little hands cannot reach them, and the same applies to guns and cartridges.

Modern farming methods demand ceaseless vigilance from all of us if we are to reduce the present rate of death and injury on our farms. Even if it means slowing down a bit, we must find time to make sure that children are out of harm's way.

Copies of a poster based on the picture above are available free from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.


The expensive way

SUGAR BEET

A. C. Owers

discusses the new techniques designed to save expensive casual labour

Towards Spring Mechanization

EVERY sugar beet grower knows the difficulty of getting sufficient labour for this crop. Fortunately the complete harvester has almost entirely eliminated the heavy autumn labour demand, but meeting the spring peak is still a constant source of concern. For this reason one of the main lines of current research is focused on new techniques that will reduce the labour demand in the spring and which may ultimately remove entirely the need for expensive casual labour.

The singling problem

For profitable yields from the current systems of cultivation, populations ranging from 25,000 to 30,000 plants per acre are necessary, the lower figure for the better classes of soils and the higher figure for light loams and sands.

Any system of cultivation which leaves these populations of well-spaced single plants is therefore acceptable, be it hand singling in the traditional style or new techniques involving the use of machines to replace the singling operation.

Sugar beet 'seed' is botanically a cluster of fruits and, therefore, often produces a number of seedlings, and this factor greatly complicates any attempt to distribute the seedlings in a uniformly thin stand along the row. Rubbed seed reduces the size of the clusters and the number of seeds within each cluster, and therefore when sown at 6–8 lb per acre, gives a good saving in singling time—up to 10 per cent. As the seed rate is reduced so improvements in singling time become greater, but a point is reached when any further lowering of the seed rate results in either too gappy a plant or the physical effort required to walk over an acre prevents any further worthwhile saving in singling time. So, if we accept hand singling, we must also accept that there is a clearly defined limit to the saving that can be made in singling time, no matter how carefully and efficiently the crop is drilled. Added to this is the fact that the whole of the beet acreage must be singled in a mere 3–4 weeks if serious yield reductions are to be avoided.

Mechanical aids to singling

Complete dependence on hand work pre-supposes an adequate supply of labour during the singling period, or limiting the basic acreage of beet to the amount of labour available. This may have been all right in the past, but not nowadays; there must either be a reduction in acreage or some form of mechanization introduced to replace or supplement the dwindling labour force. Many attempts at partial mechanization have been made, such as spaced drilling or cross-blocking, but in the main these have been unsuccessful because of the variability of the seed or the inefficient performance of the earlier spacing drills. But the comparatively recent introduction of closely graded processed seed—the discovery of an efficient form of pelleting and the introduction of monogerm seed—has led to new techniques in which the demand for hand labour may be greatly reduced or entirely eliminated.

For the grower who has little labour to spare for singling, the technique of mechanical thinning has given very satisfactory results; the closer the seed can be graded to give a high proportion of single plants, the more uniform is the final stand. With $1\frac{1}{2}$ in. seed spacing by a precision drill and a careful assessment of seedling emergence, it is possible to use the thinner to leave populations of around 30,000 plants per acre, including a high percentage of single plants.

Normally the work is done in two stages—the first or preliminary thinning to remove a percentage of the surplus seedlings in an early stage of growth, followed by a final reduction before the plants reach the four-leaf stage. The main advantages of this system are that only a light hand-trimming is needed to complete the operation, and it is a method of cultivation that is adaptable to nearly all types of soil on which beet is grown. Weed seedlings are also dealt with, although the machine has no selectivity between weeds and beet, and any irregularity in the stand of beet seedlings can cause very big variations in final plant counts. Nevertheless, where labour is scarce the system is workable and, if carefully applied, can produce crops that are nearly as heavy as hand-singled stands. Some loss in yield must be expected due to greater irregularity of plant distribution and a higher percentage of 'doubles', and both these factors can lead to reduced efficiency of mechanical harvesting.

Pro's and con's of mechanization

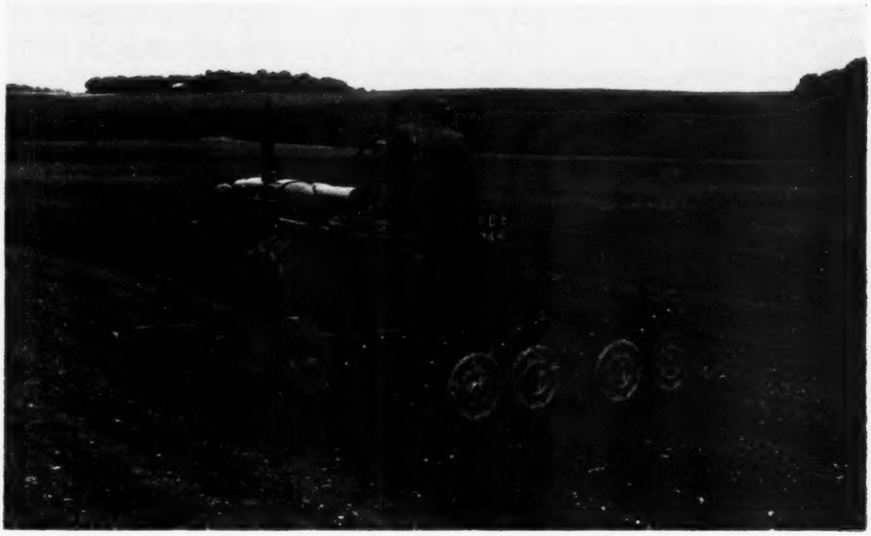
The question of 'doubles' is one of the most difficult to overcome. These can arise from a number of causes not the least of which is poor drill performance. Single seed pieces—particularly of the larger grades—can contain two or more seeds which may germinate together and prove difficult to separate under whatever system of drilling and thinning is employed. On the other hand, when the seeds are closely spaced (1–1½ in.) the distance between two strong seedlings may be insufficient for proper separation, particularly for mechanical thinning. This has led to some growers increasing the spacing distance, with a corresponding lowering of the seed rate per acre. At a spacing of 1½ in. on 18 in. rows, approximately 232,000 seeds per acre are sown to achieve a final population of 30,000 and, assuming full germination, only one plant in seven is required. But under field conditions it is only safe to expect a 50 per cent germination, giving a ratio of 2 : 7 for the thinning or singling operation. As the seed spacing is increased, so the proportion of surplus seedlings is reduced until at 4 in. intervals only three seeds are sown for every plant required. At this point, a 50 per cent germination produces 45,000 plants per acre, none of which will be standing sufficiently close to its neighbour to constitute a 'double' in the true sense of the term.

This progressive reduction in the amount of seed sown per acre is the basis of an alternative method of producing a crop under conditions of increasing labour shortage—one which for want of a better description is referred to as 'drilling to a stand'. Experimentally, seed spacings as wide as 6 in. have resulted in stands of beet equivalent to 34,000 plants per acre, and this has been achieved with no hand labour and with only a small proportion of double plants. Beyond this stage any reduction in seed rate would lead to plant populations so low as to be uneconomic.

What then are the alternatives available to the beet grower who wishes to maintain his acreage but finds himself in a position of serious labour shortage, and what are the advantages and disadvantages of the various alternatives? At the moment mechanical thinning has been well tried and proven successful, but it has never really been popular because of the irregularity of the resulting stand and the high proportion of 'doubles' that cause difficulties at harvest. Probably the system was introduced too soon, while there was still sufficient hand labour available, for undoubtedly the standard of work even under the best conditions compares unfavourably with good hand singling. The method works well on a uniform braird but is less efficient on a thick braird or one which is irregular and gappy. The main advantages, besides labour saving, are that it tackles the weed problem and it is effective on most brairds originally intended for hand singling provided the work is done soon enough. Also, since a range of thinner heads is available, the system is applicable to a preliminary thinning pending final hand singling, or to a complete mechanical operation if hand labour is not available.

Drilling to a stand

Apart from mechanical thinning, the only other labour-saving technique available to the grower at the moment is a reduction in the seeding rate, but unless there is a marked increase in seed spacing distance, savings in time are likely to be small. Increasing from 1½ in. to 2 in. will allow the beet seedlings to be left longer before singling but will not reduce the amount of effort needed, since all the ground has still to be covered.



Mechanical thinning is giving very good results. A Hudson five-row thinner at work in Cambridgeshire

The new technique now being tested of 'drilling to a stand' is a possible alternative, particularly when used in conjunction with seed pieces a high percentage of which contain single seeds—or with seed treated by the new pelleting process which improves the performance of most types of spacing drills. Seed spacings as wide as 6 in. have been used successfully on an experimental scale, but success with this method pre-supposes a high germination capacity and the preparation of first-class seedbeds. Already there is a heavy demand for pelleted seed for the new season's crop because of the anticipated improved drill performance, but little improvement in singling rates can be expected unless this type of seed is used through a good precision drill and there is a minimum spacing of 3 in. so that the plants stand singly and well isolated from each other.

The use of pelleted seed to produce brairds for mechanical thinning appears at present to be unjustified. As the spacing between the seeds is increased, there is a very sharp decrease in the possible number of final plant stations. In 18 in. rows, 1 in. spacing gives nearly 350,000 seeds per acre, but when increased to 4 in. the figure is reduced to just under 90,000 per acre, of which under normal conditions not more than 50–70 per cent can be expected to germinate.

This form of drilling is not likely to be universally accepted, but it is already attracting considerable interest on the lighter soils where good seedbeds are the rule and where pests and diseases are not normally a serious problem. The actual spacing chosen—usually 3 to 4 in.—is a matter for trial and error on individual farms, but whenever it is attempted, the highest standards of seedbed preparation are essential. The practice is not recommended on soils that tend to cap badly or for early drillings when conditions for full germination cannot be guaranteed.

Plus good weed control

Experimentally, a combination of wide-spaced drilling (using 3 in. spacings) and once-through mechanical thinning has also been tried with considerable

success, and this may ultimately prove more acceptable to those growers who are not prepared to risk a low final plant population and on soils where first-class seedbed conditions cannot always be assumed.

Finally, any form of mechanical cultivation pre-supposes a clean seedbed and freedom from weeds. Neither of the above systems of sugar beet husbandry will be successful without good weed control which can now be obtained by the use of a range of chemicals applied by a band-spraying technique over the rows at the time of drilling. Both systems are more satisfactory where some hand labour is available for the final trimming, although either can be employed as an entirely mechanical operation. A rather lower level of yield must, however, be expected, compared with good hand singling.

A. C. Owers, M.A., Dip. Agric. (Cantab.), who, in 1960, succeeded Dr. Frank Rayns as Director of the Norfolk Agricultural Station, Sprowston, was previously Director of the Ministry's Experimental Husbandry Farms at Terrington St. Clement and at Kirton. He has been engaged in research on the beet crop since 1935 and took part in much of the early experimental work initiated by Dr. Rayns at Sprowston.

CAMBRIDGE INVESTIGATION

Artificial Rearing of Lambs

J. B. Owen and D. A. R. Davies

School of Agriculture, Cambridge

WITH improved breeds and crosses and advances in flock management, the prolificacy of our lowland sheep flocks is going up. No longer is a lambing percentage of 200 the unattainable mirage that it used to be. Nevertheless, whilst this level of prolificacy is potentially attainable in the sense that such numbers of lambs are not infrequently *born*, the translation of this potential into numbers *reared* still leaves much to be desired.

Losses of lambs born of the order of 10–20 per cent are the rule rather than the exception, and as prolificacy increases there is a tendency for losses also to increase. This is especially a problem in flocks with very high prolificacy, since inevitably a relatively high proportion of triplet lambs is entailed. There is usually a high mortality among triplets and, when sets do survive, growth is impaired and susceptibility to worms is increased. The result is that the lambs are small and unfinished long after other lambs have been sold. The rearing of surplus lambs without their mothers has too often in the past entailed a great deal of labour for results that have fallen far short, in terms of growth and survival, of natural rearing.

In 1963, twenty-nine sets of triplets were born in the Cambridge University Farm flock but only in five sets did all survive, even though the lambing percentage for the flock was 166 per cent lambs reared per 100 ewes tupped. This prompted an investigation into the possibility of a cheap and efficient method of rearing surplus lambs artificially.

Replacer milk

In the spring of 1964 twenty-four lambs were taken from their dams—twelve from each of twelve ewes with triplets and twelve from each of twelve ewes with twins—and reared artificially. The lambs were out of Suffolk x Welsh Halfbred ewes by rams of the same breeding. Each lamb was removed from its mother on the afternoon of the second day of its life and was given its first feed at nine o'clock the following morning.

One of the reasons why the rearing of orphan lambs has not been too successful in the past has been the fact that they have been given cows' milk, which is of different composition from ewes' milk. Success in rearing young animals artificially largely depends on getting a milk replacer that closely resembles the natural milk. Work done at the University College of Wales enabled us to get a special ewes' milk replacer in powder form comprising milk solids (not-fat) 69 per cent, vegetable oil 30 per cent, and additives, including minerals and vitamins. This was made up with water to give a liquid with composition similar to ewes' milk.

Natural Milks and Replacer

	Cow	*Ewe*	*Ewe milk replacer*
% Solids-not-fat	8·7	11·3	12·1
% Fat	3·6	6·2	5·3

Bowls instead of bottles

Another drawback to the artificial rearing of lambs in any number has been the labour associated with bottle-feeding. In this study the lambs were fed right from the start from metal bowls. Little difficulty was experienced in getting the lambs to drink from bowls; some drank immediately without assistance and the remainder needed assistance for only a few days.

This method of feeding cut down labour considerably, since each lamb drank without individual supervision. In fact eight bowls were used and the lambs fed in batches of eight, using the same bowl three times. Cleaning these bowls was a very simple matter—merely washing in hot water once a day and rinsing in cold water between feeds. Initially, the lambs were given

Already well acquainted with the bowl at a few days old

four feeds of ½ pint each, although in their first week not all lambs cleared this amount. Since lambs varied widely in live weight, all changes were made according to weight rather than age.

As soon as each lamb reached 15 lb live weight, the number of feeds was reduced to two a day and the amount given at each feed doubled so that each lamb was still receiving two pints a day. The lambs would have taken considerably more than this, but it was decided to restrict liquid feeding to encourage them to eat solids. Each lamb was individually penned and from a few days of age had access to water and to a self-feeder containing a proprietary calf weaner pencil. Because of a subsequent investigation dealing with appetite, the lambs were not allowed access to any roughage and were bedded down on a deep litter of wood shavings; this remained dry and did not need replenishing until after weaning.

Weaning took place at 25 lb by omitting the evening feed for three days before completely stopping liquid feeding. Out of the twenty-four lambs, three died shortly before weaning from causes which could not be attributed to the diet or system of management.

Now the cost of food for rearing the lambs up to weaning:

		£	*s.*	*d.*
Milk powder	(17 lb per lamb @ 1*s.* 3*d.* per lb)	1	1	3
Calf weaner pencils	(10 lb per lamb @ 4½*d.* per lb)		3	9*
	Total	1	5	0

*Some further concentrates would have to be fed after weaning to help transition from dry food to grass.

Lambs did well

An important aspect of the success of this system is the effect on flock performance of removing lambs from their dams. Unfortunately, due to rather lower numbers of triplets in 1964, it was impossible to achieve the original intention of leaving twelve ewes with triplets undisturbed as controls.

Growth Performance, Figures of Various Groups

	No. gp.	*Birth wt.*	*No. gp.*	*28-day wt.*
Artificially reared inside				
(*a*) ex 12 twin pairs	11	10·3	11	20·9
(*b*) ex 12 triplet pairs	12	7·8	12	19·1
Naturally reared outside				
(*e*) as singles ex 12 twin pairs (*a*)	12	9·7	11	33·0
(*d*) as twins ex 12 triplets sets (*b*)	24	8·0	24	25·2
(*c*) born and reared as singles	12	12·8	12	33·6
(*d*) born and reared as twins	24	10·2	24	26·8

The lambs did very well under this system of rearing and their weights at 28 days reached 80 per cent of that for twins reared naturally, despite the deliberate restriction in the quantity of milk fed. The average age at weaning was 38 days. The lambs were born under very wet conditions; and of the three ewes with triplets turned out as controls at the time the other lambs were selected, only two lambs survived from the original nine.

To arrest wastage

We believe that a wider adoption of this method of artificial rearing could do much to reduce the lamentable wastage of young lambs in our lowland sheep flocks. This can be achieved only by weaning the lambs at a few days old, preferably before they are turned out from a lambing pen—since it is in the first month of life that the extra milk received by the remaining lambs exerts its major effect.

Obviously the problems of group feeding and the stage at which to turn out to grass must be tackled under the particular circumstances of the flocks concerned. But there is little doubt that the cost of artificial rearing would be amply recouped not only in the artificially reared lambs themselves, but even more so in the increased survival and improved growth rates of the lambs left on the ewe.

J. B. Owen, M.A., B.Sc., Ph.D., a native of North Wales, is Lecturer in Animal Husbandry at the University of Cambridge School of Agriculture. After doing research work on hill sheep problems at Bangor, he spent 3 years as a farm manager in Yorkshire and 4 years as Lecturer in Animal Husbandry at the University College of Wales, Aberystwyth, before taking up his appointment at Cambridge in 1962.

His co-author, **D. A. R. Davies, B.Sc.,** is a native of Pembrokeshire and a graduate of the University College of Wales. He spent 1½ years as assistant in research on a sheep breeding project at Cambridge before becoming Farm Demonstrator at the School of Agriculture in July, 1963.

Born 23rd February, 1889, the son of a Norfolk farmer, Sir John Hammond pioneered the artificial insemination of cattle in this country. He was created C.B.E. in 1949 and knighted in 1960. He died 27th August, 1964, honoured as much for his personal qualities as for his world-wide reputation

Sir John Hammond, C.B.E., F.R.S.

The Practical Scientist

Bryan Platt

A TALL, lean, unselfconscious figure, wearing a shabby raincoat with bulging pockets, pedalling down wide Cambridge streets on an old-fashioned bicycle; the same man, scrutinizing the livestock and carcass competitions at Smithfield Show, attending farmers' meetings, living with nomadic tribes on an FAO mission in the Sudan, or addressing scientific papers to technical conferences throughout the world. This was the late Sir John Hammond. No agricultural scientist in modern times has been better, or more widely known. No one has made a greater contribution to world food production, veterinary progress and farmers' incomes and, at the same time, retained the common touch and the warm affection of the farming community and his fellow scientists.

Sir John's unusual admixture of diffidence and dogmatism, practice and theory, experience and curiosity, versatility and concentration, made possible an incomparable contribution to livestock improvement in every part of the world. And the basis of his unique approach in that field and his liaison

between laboratory and farm or butcher's shop, lay in his own early environment. His family background was successful farming, livestock breeding and veterinary practice in Norfolk.

Animals all the way

Even scientists would find it difficult to assess the value of Sir John's research; and farmers tend to think only of its application to their own problems and economics. And that is how he would wish to be remembered. The results of his work on artificial breeding brought his most spectacular achievements, but these were in fact no more than one stage in a life's work on animal fertility, reproduction, growth rates, higher yields and general improvement.

He was always primarily interested in farming, although he took a science course at Cambridge before turning to agriculture. From then on, his interests remained centred on animals. His long scientific life and association with Cambridge started before the first World War, under Dr. F. H. A. Marshall, in the infant Agriculture Department at the University in two dark, cellar-like rooms in the basement of the old Chemistry Laboratory.

What discoveries, we wonder, would Sir John have made had he then had modern tools, white-tiled laboratories, opportunities for travel, and assistants and computers to analyse statistics? (Although, 'It is only when you come to small differences', he used to say, 'that you need statistics'.) As it was, he had to conduct his investigations mainly with rabbits, sheep bought out of his own pocket, collections from the local slaughterhouse, and a press-ganged bunch of research students.

In the early days, Sir John was very interested in the embryonic influence on fertility in farm animals, and the record shows how valuable his contribution of practical knowledge in this field has been.

But the emphasis of his interest gradually shifted from fertility to reproduction and development, and, in particular, the growth rate of cattle on which little scientific work had been done at that time. Sir John developed techniques for estimating the rate of growth of various parts of the animal body; animals were slaughtered at different stages of development, and proportional graphs were established for the different tissues. Brain grows fastest at first, then bone, muscle and fat. This is the order for all animals.

Probing the genetic potential

During this period, as throughout his life, Sir John approached every problem with an open mind. Scientific theories, like traditional beliefs, were of no value until they had been proved in the field. But his theories on the order of growth could be translated into farm practice. *Ad lib.* feeding provided every tissue with the opportunity to nourish to genetic potential; rationed feeding set up priorities within the body. It is, for instance, possible to starve an animal, yet watch development of brain and bone. And, fitting into this growth pattern, is the foetus, which has an overriding priority in the middle stage of development. Feeding at a higher plane of nutrition at the beginning and end of pregnancy is now common farm practice, and the special feeds for early muscle development, and to reduce fat in the later stages, that he advocated, have influenced farm management and the formulation of livestock feeds ever since.

Sir John also questioned the effect of genes in animal breeding. He was anxious to discover what maternal influences existed. The explanation of the limits of nutrition which the young can obtain from the mother depends, he discovered, on the size of the placenta. 'The placenta', he taught, 'is a nutritive organ and, if it is very small, the foetus will not obtain much nourishment: and if it is big, the foetus receives a lot of nourishment'.

This theory led to a great deal of controversial work with Shire stallions and Shetland mares, South Devon and Dexter cattle and, more recently, the advocacy of Charolais sires on Jersey cattle. But, although during the war he was ordered to disperse his horses, he managed to keep his experiments going by using horses and carts instead of vans! He was able to prove that there are equally important factors governing inheritance, other than genes.

He was also convinced that some other factor, a growth hormone, existed, the supply of which limits the number of embryos. But although he thought it might be possible eventually to select animals with a high concentration of 'Substance X', as is common practice for twinning or triplets in sheep, he was never able to isolate the hormone and prove his theory.

Early days of A.I.

This research, and all that he prompted others to undertake, was designed for practical application on the farm. As indeed was his work on artificial insemination. This had begun before the first World War but had largely been confined to horses. His success, so difficult to appreciate today, when A.I. is used on millions of cattle every year in most countries in the world, was achieved despite physical, financial and political limitations, and in the face of commercial and ethical opposition.

However, convinced of the benefits that semen from top quality bulls could bestow in making for the improvement of the national milk and beef herds, he had, once again, to carry out trials with rabbits. He used to recall, with evident satisfaction, his early attempts to keep semen warm by fixing tubes under his armpit whilst he cycled from Cambridge to the University farm. His successful insemination of rabbits, in Edinburgh, from semen dispatched by train from Cambridge and, eventually across Europe to Poland, make as exciting a scientific story as Marconi's early experiments in radio.

Later, Russian, Danish and American scientists helped to widen knowledge and improve techniques, but it was not until the second World War that the Government gave Sir John the facilities and resources which led to the first major breakthrough in national cattle improvement. He overcame the two biggest handicaps to development—objections from bull breeders and the Church—with his inimitable amalgam of logic and charm.

His questing mind never drugged by success, Sir John continued his investigations into maternal influence. He turned his attention to egg transference and the enormous potential of beef from the dairy herd. At present, he would say, we are getting only 'half beef'. And he proved it possible to send beef 'eggs' via rabbit 'thermoses' to South Africa for transfer to the uterus of native dairy cows. In fact, he maintained, 'in a little tube, in a thermos flask, you could send a whole herd of cattle to Australia, for a matter of shillings!'

Science into practice

'I always work for something to use in farm animals', he said. 'That is my object, not just to follow scientific fashion'. Sir John's contribution to world food production has been to put his science into practice and, throughout his long life, only when he wanted to know facts that were not already contained in scientific literature, did he have recourse to pure science. But always he returned to the farm and the producer with the application of his findings.

This philosophy affected his life and all those with whom he came into contact. His inquiring mind led him to the cattle yard, the abattoir and the fatstock show. His practical knowledge was shared through scientific papers and, in simple language, from the platform and in the farming press. His advice was offered in solving milk and meat problems in remote parts of the world. He refused to spoon-feed his students, but they found him ready to prompt and advise, and generous in his praise. 'People', he said on one occasion, 'are more important than things, and theories less valuable than application'.

The greatest contribution to agriculture which Sir John made was in bringing the application of scientific principles to the people. Much of what he discovered and taught is now common farm or veterinary practice. But he was primarily a man, kindly and colourful, lovable and generous, equally at home, in the laboratory, or on the showground, in the cowshed or the conference room. A younger generation will arise that will know Sir John Hammond merely as a great scientist. He was so much more than that.

Our strongest weapons against scour will be the practice of sound husbandry and a basic understanding of the needs of the young calf

A. H. HARRIS

OF THE MINISTRY'S VETERINARY INVESTIGATION SERVICE, NORWICH,

outlines the important aspects of these needs and shows how best to satisfy them

The Scouring Calf

THE problem of the scouring calf is one which most stockowners have encountered at one time or another and it is one that has attracted a lot of publicity during the last few years. Much research has been done and many papers published on the subject. Some of the earlier concepts of the causes of scour have lost favour and most of the earlier methods of treatment have been replaced by antibiotics. While it is evident that there will always be a place for treatment, it can never be the whole answer to the problem. We must re-orientate our thinking in terms of *prevention* before we can hope to take the scourge by the roots. Drugs have a part to play in preventive measures but we must not overestimate their importance.

Know what you're buying

It is most unwise to buy calves without knowing something of their background. It is still all too easy for the unwary to buy through a dealer a group of calves that has been passed from hand to hand, from market to market, before finally finding a home. The chances of such a group turning out to be nothing but a load of trouble are very high indeed. Before buying calves you should know whether they received colostrum, when and where they were born, how long ago they left there, how they travelled and how comfortable was their journey, and whether the vehicle called at other farms on the way. You should also be assured of the general good health of the herds of origin and of the health of the calves when they left those herds.

Knowledge of these facts, plus your own good judgment, should then enable you to buy a reasonable batch. If a dealer is involved, be careful to choose one of good repute, and if you buy calves under contract from known farms of origin, there should be a clause in the contract to cover regular veterinary inspection of those farms.

It is a common mistake to take it for granted that new-born calves left to suck their dams will *always* get their quota of colostrum. Tests done on randomly selected calves have shown that a proportion of them have not absorbed the important antibody fraction in sufficient quantities to give them a reasonable degree of protection against the commonly occurring bacterial infections. Some calves have absorbed none at all. There are a number of reasons for this, but the most important fact to remember is that the calf's ability to absorb colostral antibodies is highest during the first twelve hours of life and that it decreases rapidly after this until, after thirty-six hours, it virtually ceases altogether. To deprive a calf of these antibodies is to run a very grave risk of exposing it to infection, so that it is essential to know for certain that the dam's colostrum was consumed regularly and in full amount, from a few hours after birth until the third day of life.

The journey and first feeds

The journey must be as quick and as comfortable as possible, because even under good conditions the stress of travel imposes a great strain on the young calf. Careful planning is necessary to ensure that the vehicle provides the maximum comfort and that the drivers are sympathetic to the calves and will get them home smoothly and quickly. Overcrowding brings misery and fear to the calf and must be denounced as cruelty. Where appropriate, the transport must comply with the provisions of the Transit of Calves Order 1963.

The importance of the composition of the calf's first few feeds after arrival should by now be fully appreciated, so I will not dwell on this except to emphasize that the first feed must be water and glucose only, and, from the second feed onwards, the amount of milk powder should be gradually increased until the maximum concentration recommended by the manufacturer is reached, usually by the third morning. It is important to choose a reputable brand of powder of proven efficiency and to follow the manufacturer's instructions implicitly. One aspect often overlooked is thorough mixing, because this means ensuring that the made-up solution as fed to the calves contains *no undissolved powder at all.* The reason for this I shall explain shortly. A good way of making certain that the powder is properly mixed is to run the solution over a clear glass (a clean milk bottle will do), when any lumps of undissolved powder will be easily seen. An electric mixer is an asset.

Indigestion

The digestive system of the young calf is a very delicate and dynamic mechanism which is easily thrown out of balance, so much so that it is no exaggeration to say that a high percentage of scours, probably more than half, is triggered off by a period of indigestion which may in itself seem trivial. Let us see how this could come about.

Consider a calf a few days old which has been fed on a solution of milk substitute containing small lumps of undissolved powder. In the fourth stomach these lumps are likely to set up indigestion, with the result that

there is interference with the clotting mechanism and a poorly formed clot, too fluid in consistency and containing lumps of undissolved powder, is passed too quickly into the first part of the intestines. Because it is not properly clotted, this material is passed too quickly down the intestines for its water content to be absorbed sufficiently. So it arrives in the large bowel in a semi-fluid state.

Here it meets masses of bacteria which probably would do no harm under normal conditions, but in partially digested food material they begin to multiply at a fantastic rate and very soon ascend the intestines towards the stomach. This sets up localized irritation, with the result that the osmotic balance of the intestines is upset and fluid from the body passes into the gut through the cells in the gut wall. The calf is now scouring, and unless this process is stopped dehydration will go beyond the limit that the calf can stand and it will die.

This underlines how important it is with a scouring calf to keep up the water content of the body and so counteract the effects of dehydration, and to reduce the solid fraction of the diet so that the digestive system is not put to even greater strain. It also emphasizes that scour can develop without any bacteria being *primarily* involved. Indigestion can arise in many ways and I have chosen only one, but the result is usually the same—a sticky end.

Provided the accommodation for the calves is of high standard, comfortable, dry, of even temperature and free from draughts, and provided the attendant is experienced, reliable, efficient and kind, then attention to the following points will provide a basis for the prevention of scours.

*	**Know where your calves come from and be happy about it.**
	Be certain of their colostrum consumption.
	Insist on good transport conditions.
CODE	**If whole milk is not used, select a milk substitute of good repute.**
OF	**Give only glucose and water for the first feed, then introduce milk substitute gradually, giving full amount of water in each feed.**
CALF	
	Ensure that the milk substitute powder is completely dissolved.
CARE	**Follow the manufacturer's instructions for feeding.**
	At the first signs of scour reduce the concentration of the powder by half but use the full quantity of water. If the calf scours for two feeds in spite of this, or if it looks sick, then call in your vet. at once.

YIELDS · COSTS · RETURNS

What control has the lettuce grower over these factors?

Miss M. M. Armitage

N.A.A.S. Horticulture Adviser in Surrey, comments on the question

Is there money in lettuce?

GIVEN a light, free-draining soil and sufficient irrigation in a dry season*, an experienced lettuce grower can have a fairly good control over his yields. The difference per acre between a hard-earned 200-crate and a 600-crate crop in a difficult season may be vital; the difference between a 600-crate and a 1,000-crate crop in a glut period may matter relatively little. The lettuce for which a housewife pays 1*s*. 3*d*. or 1*s*. 6*d*. during a heat-wave, may be typical of only a small percentage of the crop—contrary to opinion in some quarters!

In the bed system, widely used in Surrey, the initial plant population may be 49,500 per acre, but the marketable crop rarely exceeds 1,000 crates or 24,000 lettuce, per acre; often it is much less, especially in a difficult period. Disease accounts for much of this disparity.

Lettuce Mosaic Virus probably causes a heavier financial loss than any other disease—up to 100 per cent following severe aphis attack—and the same conditions that favour aphis breeding are often those most conducive to salad eating! The successional sowings which are necessary on a specialist holding present a nucleus of infection, and since the virus is immediately transferable by aphids, even early systemic sprays have proved relatively ineffective. There may be a varietal tolerance which could be utilized here

*3 inches per acre was needed for some lettuce crops in Surrey during 1959.

Planting lettuce on the bed system

Economic loss through Big Vein virus is difficult to assess, since affected lettuce are usually marketable. The frame-raised transplanted method allows plenty of time for the virus to develop, but little attempt at sterilizing the frame soil is apparent.

Human element

Botrytis is often the scapegoat for losses in frame-raised transplanted lettuce, but Botrytis either comes through injury or is secondary to other causes, such as Rhizoctonia. Too much emphasis is usually placed on winter injury in the frame and too little on the human element that causes injury at planting time. In the bed system, where one planter is responsible for an individual bed, I have noticed a difference in gaps of as much as 50 per cent, repeated like a replicated experiment by the worst and best planters—an effect that under other systems would probably have gone unnoticed. Bad planters should be kept off lettuce!

Losses can also be avoided by keeping tractors off wet soil. Initial soil preparation for spring planting or sowing is often tackled too soon, with the result that the tractor wheels leave a hard pan, impervious to roots. Losses were understandably serious following the late spring of 1963 when subsequent hoeing did little more than leave a deceptively friable surface. Sunny weather does not necessarily mean suitable soil conditions! Other diseases, such as Rhizoctonia, can be controlled more readily by the grower than they have been in the past, and the same applies to pests such as Root Aphis.

Cutting the cost

Cutting growing costs is a challenge well met by the experienced grower. Frame-grown transplanted lettuce are more expensive to raise throughout, because of the cost of hand labour on the frames during the winter and for planting during periods of peak demand in spring. It is doubtful whether we shall ever get a machine gentle enough to do the job of a good planter.

Growing in beds reduces subsequent labour, especially with drilled lettuce, since this system can be utilized from drilling to harvesting. The bed goes under the belly of the tractor, the remainder of the area being paths for the wheels, and both are kept for the life of the crop. The tractor span is 76 in., usually a unit of six rows 11 in. apart, with paths 21 in. wide. Those loth to alter normal tractor width may have a modified bed system for spraying purposes; but once sown or planted in the conventional beds, tractor wheels compact only the paths.

Residual herbicides are used directly after sowing, and often the only hand labour up to harvesting consists of thinning or chopping out. Even this operation could be eased by a system of good space sowing, since single plants can be chopped out more easily. Plants sown at 3 in. and thinned to 9 in. do not, of course, allow for a loss greater than two-thirds.

The cost of labour for harvesting may equal the labour for all growing operations with a 1,000-crate drilled crop. Common sense, otherwise known as work study, applied to harvesting in particular will yield bigger dividends than too much cheese-paring elsewhere. With the bed system in common use, walking time is reduced to a minimum. The tractor travels through the crop and boxes laid out at intervals beforehand are loaded directly on to the tractor. Each lettuce must nevertheless be selected individually. If the crop is a poor one this is time-consuming, but the poor crop is often the more remunerative one, and the grower must weigh the extra time involved against the prevailing price.

The grower with his own market stand has an advantage in being able to send up returnable crates and bring them back to the farm on his otherwise empty lorry. But there are differences of opinion on the costs of using returnables. It may be argued that a crate costing 3*s*. 6*d*. to 4*s*. and making four return journeys to market costs 10½*d*. to 1*s*. a journey, but where records of crate purchases have been kept, the low average cost has come as an

Gaps don't make for profit. The effect of bad planting

agreeable surprise. It would be interesting to follow the movements of a returnable crate. The older ones that 'migrate' are obviously an advantage to a grower who keeps the deposit to buy in new.

The unloading of empties on the farm and repairs are more subtle costs to be added on, though repairs are usually done during bad weather in winter. To the newcomer or those with no market facilities or connections, the returnable crate is largely of theoretical interest; 1*s.* 4*d.* to hold twenty-four lettuce works out at the rather frightening figure of £67 per acre for a 1,000-crate crop. The grower has no control over this figure; he can only decide when it ceases to be economic to market.

Uncertainty of returns

Those who have had most to do with lettuce growing are least likely to commit themselves as to returns. In 1959, a difficult growing year, the lowest average weekly price on one farm was 4*s.* 6*d.* per crate and the highest weekly price 16*s.* Sporadic peak prices were often as high as they were misleading. In the case of the previous factors considered, yields and costs, the grower was seen to exercise some control; but in the case of returns this control practically ceases because it is governed by supply and demand. It is true that the grower can study demand over the seasons and note certain trends in his particular market. He sees that lettuce prices go down at the strawberry peak, which is also the time when private gardeners are using their own sowings; that the London markets tend to be slack during the summer holiday periods; that the most consistently good prices for lettuce occur between the finish of the glasshouse crop and the start of the first frame-raised transplanted, a gap he has been filling with lettuces covered for half their life by mobile glasshouses. But these indications can be dwarfed by unpredictable factors.

Over-production is one of these, but that does not necessarily mean that more people are growing lettuce. It can occur without any change of acreage because of a favourable growing season. The relationship between yields and returns is often inverse, for nothing can be more disastrous to a good grower than a season where skill and experience do not come into their own and where it is difficult *not* to grow a good lettuce. By and large, growers prefer a steady reasonable return rather than violent fluctuations in price, particularly since high prices can lead to consumer resistance. In this country of fine-weather salad-eaters, a drop in temperature can knock as many pence off a lettuce as degrees on a thermometer scale. It would be helpful if the Continental custom of supplementing, and not replacing, salad with a hot vegetable could be more widely advertised.

Keeping up the supply

When does it cease to be economic for a grower to market his lettuce? Assuming the grower has no alternative to using non-returnables, a lettuce would have to make 1*d.* to pay for the crate and harvesting costs alone. Thus, other considerations aside, it would not pay to market it at less than 2*s.* a crate, plus the transport costs. Commission charges will naturally depend on the selling price, which can change between harvesting and sales. A grower sending in returnables could go lower than his non-returnable neighbour and since he is often the one with a stand at the market, he may anyway be more reluctant to break continuity of supply.

Continuity of supply! How well these three words sum up the experienced grower's attitude to lettuce. In spite of many years' experience, he still cannot tell which crop will come up trumps, which crop will pay nicely, which crop will just about break even and which one he will have to plough in. Production costs in materials and labour may already have reached over £100 per acre for the frame-raised transplanted lettuce and perhaps £20 less for the drilled crop, and only he can decide whether to incur harvesting and marketing costs in addition. The intensity of his lettuce growing may invite pest and disease attack, but he will continue to make fourteen or so successional sowings each year because experience has shown that a break in continuity of supply could mean missing the best market.

Miss M. M. Armitage, N.D.H. (Hons.), joined the N.A.A.S. in 1948 and served in East Sussex before taking up her present post as District Horticultural Advisory Officer for East Surrey. She received her horticultural training at Reading University, and later worked in the tropical propagating department and ferneries at Kew Gardens. During the war Miss Armitage was, for three years, demonstrator on the Ministry's allotments in Hyde Park, and, besides cultivating these allotments, her duties included lecturing and sitting on Brains Trusts in furtherance of the 'Dig for Victory' campaign.

New Scientific Advisory Panel

To advise him on the many varied problems having scientific implications with which his Department is concerned, the Minister of Agriculture, Fisheries and Food, the Rt. Hon. Frederick Peart, M.P., has appointed a Scientific Advisory Panel, under the Chairmanship of PROFESSOR A. C. FRAZER of Birmingham University.

The Panel will consist of:

Professor A. C. Frazer, C.B.E., M.D., B.S., Ph.D., D.Sc., F.R.C.P., Professor of Medical Biochemistry and Pharmacology, University of Birmingham; Member of the Agricultural Research Council; President, British Food Manufacturing Industries Research Association; President, British Industrial Biological Research Association.

Professor T. A. Bennet-Clark, M.A., Ph.D., F.R.S., Professor of Botany at Nottingham and London Universities 1936-62; Professor of Biology and Dean of the School of Biological Studies, University of East Anglia, from 1962; Member of the Agricultural Research Council.

Professor E. B. Chain, M.A., Ph.D., F.R.S., Professor of Biochemistry, University of London, at Imperial College.

Professor M. McG. Cooper, B.Agr.Sci., B.Litt., F.R.S.E., Dean of Agriculture and Professor of Agriculture and Rural Economy, University of Newcastle upon Tyne; Member of the Agricultural Advisory Council.

Professor O. W. Richards, M.A., D.Sc., F.R.S., Professor of Zoology and Applied Entomology, at Imperial College, London.

Sir John Ritchie, C.B., B.Sc., D.V.Sc., F.R.S.V.S., D.V.S.M., F.R.S.E. At present Chief Veterinary Officer, Ministry of Agriculture, Fisheries and Food, but shortly retiring to take up the post of Principal and Dean of the Royal Veterinary College, London.

Items from the 3rd Report of the

HILL FARMING RESEARCH ORGANISATION

On the Hills

THE results of experiments with hill sheep are often difficult to interpret because the effects of the treatments may be obscured, or even swamped, by seasonal effects.

At Sourhope, one of the three Scottish hill farms of the Hill Farm Research Organisation, groups of ewe hoggs were taken off the hill for periods of preferential feeding and afterwards returned to the hill. It was hoped that this would show conclusively what the relation is between rapid growth in early life and long-term productivity on the hill but, as in an earlier trial at Sourhope, seasonal effects minimized the nutritional effects and the results could only indicate general trends.

Unsocial behaviour

There is the further difficulty that hill grazings do not necessarily provide the random environment that is generally assumed to exist. This is because sheep undergoing experimental treatments tend to form social groups which persist on their return to the hill. In one instance such a group was forced by the resident sheep population to occupy a relatively sparsely populated part of the hill where the vegetation was poor. Thus the effect of this social behaviour was to question, if not nullify, the design of the experiment. Experiments are now being planned which aim at either eliminating non-random distribution or equalizing the treatments within each social group. It is not known how long these social groups persist, but if they are permanent it is concluded that there may be some disadvantage in wintering ewe hoggs off the hill.

The winter feeding of ewe hoggs has also been examined in relation to its effect on the later breeding performance of animals which were above or below the average weight at six months. Results suggest that it is preferable to concentrate on the below-average hoggs rather than to go to the expense of wintering all off the hill, and that, since the advantage to below-average hoggs appears to be only temporary, it may be wiser to pay greater attention to getting good growth and development during the first six months of life.

Enclosures pay

Another experiment at Sourhope has shown the benefits of controlled grazing on the hill. Parts of the hill were enclosed with the New Zealand type electric fence. The enclosures were stocked with ewes and lambs in the period from lambing to weaning, cattle being used as required to remove surplus vegetation. After weaning, the ewes were run as one flock and rotated through the enclosures at intervals, with provision for each enclosure to be rested during the autumn. Under this system sheep numbers have increased by 85 per cent and the stocking rate is roughly double that for the rest of the farm. Skeletal measurements showed that the control grazed sheep were larger, and they were heavier and more productive than those on free range.

Broken-mouth

In common with many farms in north-east Scotland, the hill farm at Glensaugh has a history of 'broken-mouth' in its Blackface ewe stock. The drain of minerals, particularly of phosphorus, during lactation could be one factor causing this condition. Trials with ewes given daily supplements of phosphates showed a fall in blood phosphorus levels when the supplements were discontinued after four months. It seems that hill ewes require phosphate supplements immediately they are transferred to in-bye lambing pastures and throughout lactation. At Glensaugh experiments are also going on to test the effect on 'broken-mouth' of injections of selenium.

Shelter unwanted

Shelter experiments at the Lephinmore hill research farm in which groups of hoggs were provided with artificial shelter have shown, as in an earlier trial, that no use was made of the shelter, though when shelter appeared necessary the animals sought the natural shelter afforded by hedges, rushes or undulations of the land. Sheep appear to be more sensitive to wind speed than to any other climatic factor. Even wind speeds as moderate as twelve miles per hour increase the heat lost from fleece-covered surfaces in a sheltered environment by three or four times. In this connection it is interesting that in another trial, to examine the effect of protecting sheep from exposure in the winter months, fitting sheep with coats made of jute sacking benefited neither live weight nor fleece weight.

Worm burden studies at Lephinmore and Glensaugh indicate that such infestation is rarely a problem on the hill, but that the use of anthelmintics is often desirable when hill sheep are run in-bye for fattening.

The improvement of hill pastures seems largely to depend on the extent to which white clover can be made to grow productively in a hill environment. This may be linked with the presence in the soil of effective strains of *Rhizobium*, for which there is some evidence that the degree of soil acidity exerts partial control.

In bracken control experiments comparing herbicides such as 4-CPA nonyl ester with twice-yearly cutting, both treatments gave the same degree of control, about 40 per cent, as measured by frond production three years after spraying.

A. J. L. LAWRENCE

C. S. Barnard

Farming is an art, but it is also a highly organized business that needs every up-to-date device and technique it can command. The computer is one of them

Computers at the Farmer's Service

ELECTRONIC computers are already serving farmers in many ways; from the formulation of proprietary animal feeds to the breeding of better livestock; from the compilation of actuarial tables in insurance offices to the calculation of monies owed by marketing boards; from research into farm management problems to the analysis of the statistics of the industry.

These are all indirect uses. But the computer may play a direct role in the management of the individual farm, indicating what combination of crops and livestock is likely to pay best and the cheapest methods of producing them.

Although there is some commercial use of computers in this way, as yet there seems to be no very general demand for their services. In part this may arise from a lack of understanding of what is involved and what is to be gained from planning a farm by computer.

Why plan in the dark?

A lot of people think that before a computer can be used a large volume of very precise data has to be made available. In fact, the data required are no more and no less than are needed for other methods of planning. They

fall into three categories—the quantity and type of resources available on the farm (together with less tangible restrictions such as quotas and preferences), the demands which the different enterprises make on these resources and their gross margins. Admittedly, with computer planning the first step is usually to assemble the data, whereas with other methods some of it, at least, may be held in abeyance until a later stage. For example, a plan may be worked out which ignores the amount of labour available and the requirements of the various enterprises for that labour at different times of the year, the feasibility of the solution being checked afterwards. If, in fact, the enterprise requirements do not fall within the amount of labour available, planning has to start afresh.

Under computer planning it would be normal practice to include the labour data at the start, so that it automatically follows that the solution is feasible on this account and needs no further checking or re-planning.

There is a further point. The task of formally assembling planning data can be a very salutary exercise for the farmer, in that it shows him just how much he does and does not know about the many relationships between the resources and enterprises on his farm. Such knowledge is vital to good business management.

Servant—not master

There may also be the feeling that the computer treats the farm problem in an entirely impersonal and unrealistic manner—mechanically throwing out 'optimum' mathematical solutions that have little chance of being applied in practice. The impersonal nature of computers cannot be denied, for they are simply machines capable of performing a mass of arithmetic in a very short time. But if the solution appears unreal the fault lies not in the computer but in the data that have been fed into it.

Computers cannot think for themselves. They have to be instructed what operations to perform on the data. In planning a farm, this is to calculate the combination of enterprises and practices—out of those that have been fed in—that will give the greatest total gross margin, paying due regard to the limitations imposed by the amount and quality of resources available, and the use the enterprises make of them.

Thus the computer does not decide how much labour is available on the farm, nor the work performances, food conversion rates, yields and so forth that appertain. Equally, it does not decide whether it is possible to grow, say, sugar beet or potatoes. If, however, it is instructed that these crops *can* be grown, it will indicate whether or not it is desirable to include them and if so, at what level. The latter will be determined by the degree of competition for scarce resources, but will fall within the levels imposed by quotas, contracts, rotations, labour availability and the like, that have been fed into the computer.

Moreover, although the computer is an impersonal machine, allowances can readily be made for the very personal nature of much of farm planning. For instance, a farmer who has been in dairy cows all his life may not be willing to farm entirely without them. The computer would, in consequence, be instructed to include a certain minimum number of cows. Having first satisfied this command, it would then proceed to plan the rest of the farm. In this way, a herd may be included, even in those cases where a truly 'optimum' solution—from the financial angle alone—would have excluded

them. In short, the computer has first satisfied a particular preference of the farmer, before going on to 'optimise' financial returns with the resources still left over.

Some farmers may also feel that the scale of their planning problem is too small to justify the use of computer analysis. It may seem reasonable enough in a factory employing several hundred workers and complex plant and machinery the year round, but it may appear less justified on a farm with fewer resources involved and with much of the work of a highly seasonal, rather than of a continuing nature. But this is to ignore the fact that the farmer has a whole range of problems of a type that don't assail the factory owner, and of which seasonality of labour requirements is but one. Variations in yields and prices from year to year, the uncertainity of how long a particular task will take to perform, the complications inherent in having more than one soil type on a farm are a few of them. Thus although the farmer's problems are of a different nature, they are no less pressing. The farmer is just as interested in a good plan as is the factory owner, so why should he not attain it by the best means available?

Strategy rather than tactics

It is not an uncommon belief that farm planning is a relatively simple affair, largely based on intuition or, at most, some figuring on the back of an old envelope. No doubt there are many cases where decisions made in this way are adequate, particularly when they concern the day-to-day operation of the farm rather than the planning of longer-term adjustments. The risk is, however, that the two types of problem are regarded as being at the same level, and elementary planning methods are applied to what seems a small problem, but which in reality involves the whole farm.

To take an example. A farmer is thinking of buying a sugar beet harvester to replace hand-harvesting by his regular staff. At first sight this may appear simply a matter of balancing the depreciation, interest and running costs of the harvester against the number of hours of regular labour saved at the going wage rate. Unfortunately, this begs the whole question of what the labour is really worth. It may be possible to reduce the labour force by one man, but this entails a detailed consideration of other periods of the year when the work-load is heavy. With a man less, there may no longer be an adequate gang at cereal harvest, unless the present bagger harvester is replaced by a tanker, which in turn raises the problem of handling grain in bulk instead of in sacks.

Or again, it may not be possible to single all the sugar beet in spring so that the purchase of a precision drill and down-the-row thinner may have to be considered. On the other hand, if it is decided that labour cannot be dispensed with, it may instead be possible to expand the sugar beet itself; in which case extra sugar beet may replace a ley, and that means that less grazing stock can be carried. Also a proportion of winter wheat has to be replaced by a spring cereal because the sugar beet is not cleared in time for a seedbed to be prepared.

Thus a problem which in the first instance seemed to fall into the 'back of an envelope' category has developed into one involving much of the farm and with many alternatives to be considered. In a situation like this a computer would be helpful.

Break-through

In acknowledgment of the fact that planning is not a simple and straightforward process, more sophisticated techniques of farm planning without the use of computers have recently been developed—programme planning, gross margin planning, cost-benefit analysis—call them what you will. What advantages has computer planning to offer over these?

In the first place, however sophisticated those methods may be, there is always the need to simplify the problem so that the arithmetic is kept within manageable proportions. Simplification is not in itself a bad thing, always provided that the problem is still stated in a manner comprehensive enough to remain realistic. In many cases this is not so. For example, where livestock—say dairy cows—are to be included in a farm plan, a fixed pattern of feeding is commonly assumed. In other words, so much grazing, bulky fodder, cereals and purchased concentrates per cow. But the feeding pattern is itself part of the planning problem—for what is required is the pattern that best fits in with the farm situation as a whole. Hay may be preferable to silage, because it creates less labour difficulties in early summer if sugar beet is also included in the plan. Or, in a situation where land has a high value in alternative opportunities, cows fed the maximum of purchased food may be preferable to those maintained on a self-sufficient system, because of acres saved. Since the computer handles the arithmetic, it is possible to set the problem up in a comprehensive manner, with far less risk of unrealistic over-simplifications.

Furthermore, the computer allows a whole range of situations to be considered in addition to the farm plan based simply on present resources and practices, for the latter can be quickly modified to allow for different sizes of labour force, rotations, methods of producing crops and livestock and so forth. In this way the farmer can get a general picture of the lines along which his farm might best be developing in the future. Such studies have already been carried out on a broad basis*, but there is no reason why the alert manager should not do the same on what really counts to him—his own farm.

Computer analysis offers a real break-through in management techniques, with which to match the tremendous strides that have been made on the technical side. Although commercial management services making use of computers are at present few, they will undoubtedly develop if the demand is there. And the demand *should* be there, for investment in really comprehensive planning may well yield higher returns than any other investment on the farm.

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*For example. *A Design for Farming.* Report 61, Farm Economics Branch, Cambridge University.

The author of this article is a Senior Research Officer in the Farm Economics Branch, School of Agriculture, Cambridge University. He has for many years been interested in problems of farm management and, in particular, the rôle the computer can play.

Bin storage can spell danger when built without competent advice. Unless farmers are ready to seek professional guidance, they will do better to erect ready-made containers

SAFE WALLS

R. E. Dawson

OF all foolish things, building a wall of a store (whether for grain, fertilizer or potatoes) without knowledge of the forces that a stored product will exert on it, is one of the greatest. True some farmers have got away with it—so far; but others have not been so lucky.

The danger lies principally with brick walls, blockwork walls and walls of unreinforced concrete. Steel, timber and reinforced concrete will give visible warning of impending failure by excessive bending. Not so bricks, etc.; these materials are brittle and the whole wall will collapse without warning.

'Rule of thumb', or the adoption of a section seen elsewhere being used successfully, is no guide, for except in the case of 'gravity stable' walls (of which more later) the strength of the wall depends on that very variable factor—workmanship.

Before starting to build, the farmer should try to visualize the effect of the wall or bin collapsing completely and assess the danger of this event to himself and his workers. If there is any possibility that a man could be harmed by such a happening, it is clearly the farmer's duty to seek competent advice. A civil engineer will certainly advise the use of some material other than bricks, blocks, or unreinforced concrete, for the following reasons.

In dealing with long walls not supported by cross-walls, buttresses, etc., or for walls between the columns of concrete-frame buildings where it is impossible to tie the wall to the columns, the design must be such that the weight of the wall prevents it being overturned (i.e., it is 'gravity stable'). In Figure 1, profiles of walls are shown which will *only just* resist the forces against them. Walls of type 'A' are designed for grain level at the top of the wall, and type 'B' for grain sloped up from the top of the wall at the maximum angle that it will withstand. These walls will obviously have to be built thicker than the dimensions shown in order to have some factor of safety. Equally obviously, the expense of walls of these types above about 4 feet will preclude their use.

To achieve a more economical section, a designer would have to support the wall with buttresses, tie it to the building columns, tie opposite walls

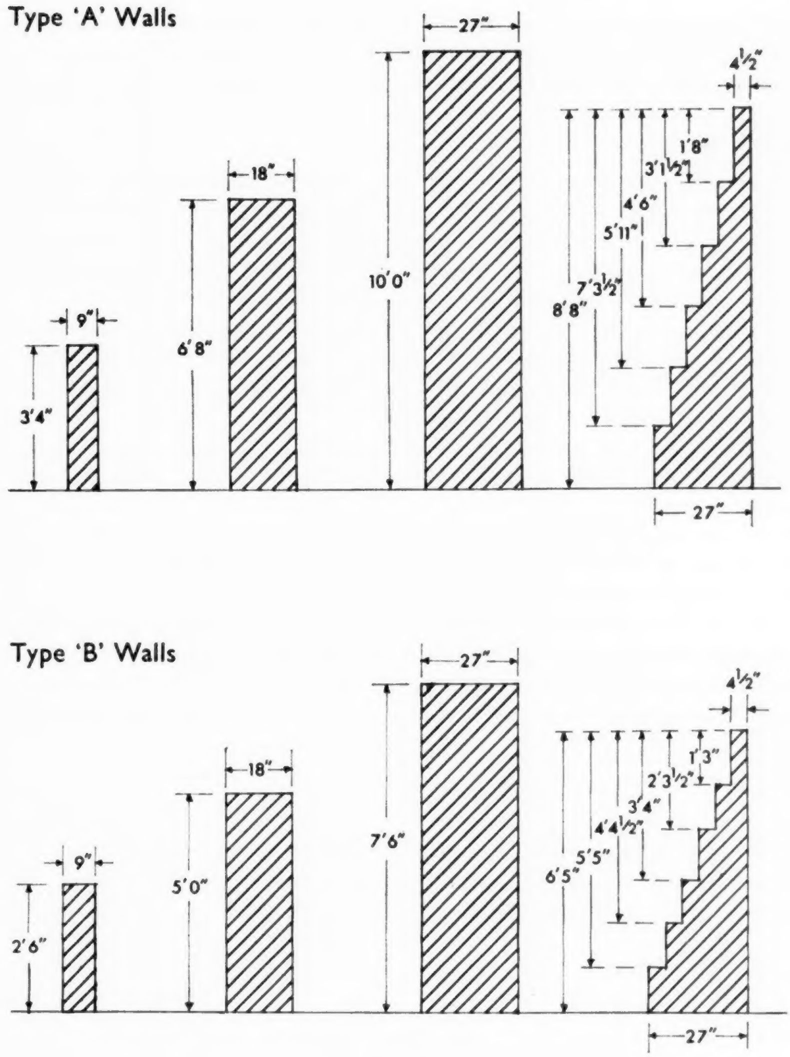


Figure 1

together, or use some similar dodge to prop it up. The forces on the wall would then be resisted partly by its weight preventing overturning, partly by it acting as a beam in a horizontal direction between the supports and probably partly as a cantilever from the foundations. Analysis of the stresses in such a system is an extremely complex problem. The mathematics involved are formidable and it would probably be advisable to use computers in its solution. Obviously this is not an economical project, as the design cost might well be greater than the cost of the structure.

The designer therefore has to fall back on the experience he has gained of similar works and on the reports published in technical bulletins of like structures. By these means he will be able to design a wall or bin that can be relied on not to collapse, but the design will be conservative and the result expensive.

Fortunately there are materials other than bricks, blocks and plain concrete with which to work, and with a little technical guidance a farmer should be able to do-it-himself economically and safely.

Tilt-up walls

Reinforced concrete, cast in place (i.e., between shutters) may seem to be worth using but in fact is not. When a series of bins or a buttressed wall is designed, the wall thicknesses necessary are so small and the reinforcement so light that it would be very difficult to compact the concrete properly and still keep the reinforcing bars in the positions they should be.

A better approach, I think, is that of 'tilt-up' walls. These are thin walls, suitably reinforced, cast flat on the ground with the bottom edge of the slab on the line with its final position. When these are strong enough they are reared into position and bolted together.

A similar method using narrow precast slabs, is indicated in Figure 2. The slabs here are held at the top by a steel angle bolted between adjacent columns. Such units will of course need to be properly designed. The design is, however, simple and ought not to cost more than a few pounds if a local engineer can be found to do it. The Surveyor to the Rural District Council might be able to name a suitable man.

It should be noted that in this system load is transferred to the building columns as a horizontal outwards thrust. Its magnitude depends on the column spacing and the height of the wall. As an example, an 8-feet wall with grain level at the top will put a load through the R.S.L. of 3,000 lb if the columns

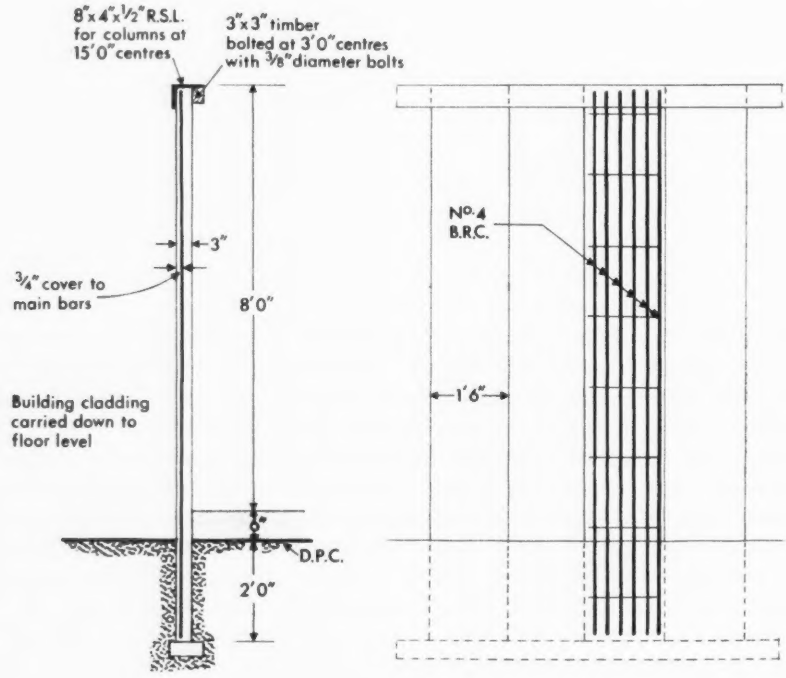


Figure 2

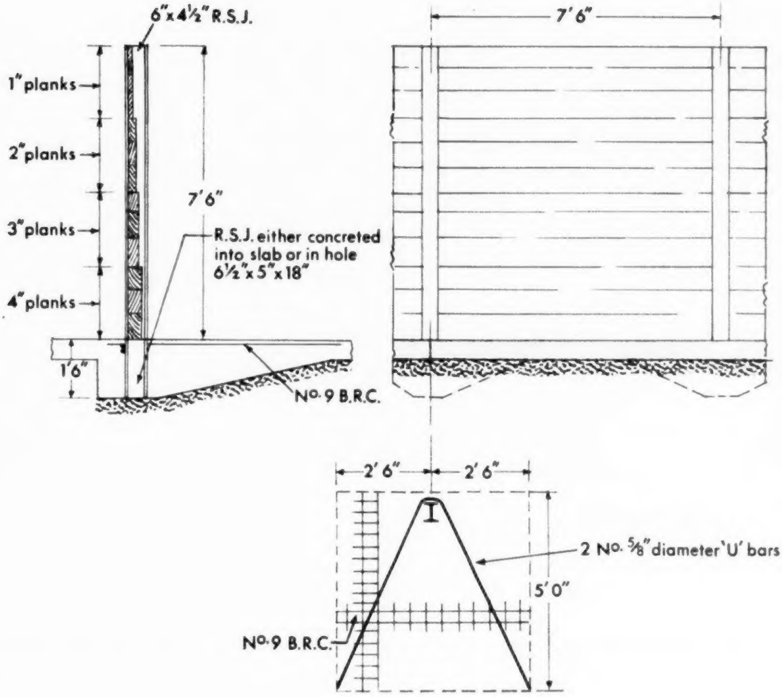


Figure 3

are 15 feet apart. Buildings must be checked to see whether they are strong enough to withstand this extra loading, and this is best done by contacting the manufacturers, giving them the position and magnitude of the thrust and asking if the buildings will carry it.

Timber planks

Another system which I think warrants development is shown in Figure 3. In this timber planks are used to span horizontally between R.S.J.s. These R.S.J.s are set into holes in the floor slab and the floor slab is thickened and reinforced in this area around the hole. The design is such that the overturning force on the wall is resisted by the weight of the grain on the section of the floor which is reinforced.

It is a pity that I cannot recommend a system whereby a farmer can make his bins without professional advice, but I am afraid that he must either do this or take unwarranted risks. I am certain, however, that if the advice comes from a competent engineer, not only will the farmer have the assurance of safety, but the final cost will show a saving greater than the fees involved.

R. E. Dawson, B.Sc.(Eng.), A.M.I.C.E., is in private practice as a consulting engineer. After serving with the R.A.F. on airfield construction during the war, he became Resident Engineer with the Steel Company of Wales at Margam, and later worked as Assistant Engineer on the Claerwen Dam. He started his own practice in 1951 and is now almost solely concerned with agricultural buildings and structures.

Margaret Murray
NAAS • SUFFOLK

N. R. C. Chaplin
NAAS • LINCS

Poultry Drinkers

How efficient are feeders and drinkers in poultry houses? A NAAS survey of 100 farms in East Anglia suggests that there is room for improvement. Observations on feeders were made in last month's issue of 'Agriculture'

THE 1963 N.A.A.S. survey disclosed the use of three main types of poultry drinkers—weight operated, float valve, and the nipple or peck valve. Without exception no troubles were experienced when the units were first installed, but subsequently the method of installation and type of water supply did lead in some instances to waste or spillage.

A point which became very obvious early in the survey was the need for a *planned* water supply, incorporating a soundly conceived disposal system as well as a properly organized intake. The second major finding was the desirability of operating all automatic systems through a header tank, and ideally there should be one for each house. The header tank allows the maintenance of a constant water pressure on the valve, and this desideratum is not always possible with direct connection to a main supply. To avoid waste, and for other reasons, it is possible that at a future date Local Authorities and Water Boards may make the installation of header tanks compulsory. Another advantage of the header tank is that medication—if employed—is more easily managed.

Points for manufacturers

A third conclusion was the desirability that all water for drinkers should pass through a filter at some stage before it reaches a valve. Such filters must be cleaned regularly; the amount of sediment that may be included in some water supplies, leading to blockages or leaks of the valves, is truly amazing. For the same reason it is wise to keep out dust by covering the header tanks.

Some of the galvanizing, at the stage of life when most of the equipment was examined—3–5 years old, was found to be unsatisfactory. None was labelled as being of B.S.I. standards. In some districts impurities and the

A planned supply of clean water at all times is essential

use of certain metals in connecting up the water supply had led to the rapid deterioration of the galvanizing. The use of alkathene piping and connections has done much to eliminate this risk.

Finally, the survey pointed to the need for all moving parts in automatic drinkers to be properly machine-finished, all valves should seat properly and all parts should be of high-grade metal. Irritation and injury to the birds can result from rough edges. Where springs are used, breakage or failure due to metal fatigue occur, unless the quality is high, and the reasonable expectation of their lasting over a twelve month with fair wear and tear is not fulfilled. The survey also indicated that with some drinking equipment the inlet and outlet holes were of such a size and so placed that they often became choked with meal sediment and not easily cleaned out.

The amount of wasted food found in some water troughs (and that means money) reached really alarming levels at some of the farms included in the survey. (This aspect would be an essential factor to be included in any testing scheme.) Mash feeding was incriminated in those instances where the greatest degree of waste in the water troughs was recorded; and the advantages of the nipple or peck valve drinker does, of course, eliminate the possibility of waste being promoted by mash feeding. This type of drinker not only obviates the need for periodical cleaning, but removes the possibility of spillage from any cause, and blocked valves are not a problem if the water supply is adequately filtered.

Although the conclusions of this survey were essentially of a critical nature, it is also good to be able to record the existence of some eminently efficient drinking equipment, among them the round hanging type of drinker. The long, narrow, fixed or hanging troughs spill water easily, and this happens frequently when birds bump into them; the round hanging trough tends to glance off without spillage when bumped.

With drinkers operating through the hanging weight, there seems no alternative to metal. Rusting of metal unfortunately continues to be a problem, and although this can be overcome to some extent by covering with polyethelene or vitreous enamel, once the surfaces are damaged deterioration soon sets in.

CHEESE, SIR? *English, of course!*

JERVAULX ABBEY in ruins
but the cheese lives on

WENSLEYDALE

Marjorie Middleton

WENSLEYDALE, like many other English cheeses, suffers from the present-day tendency to market it in an immature condition. In spite of this, even the newest of Wensleydales has its own distinctive quality.

The art of making Wensleydale cheese (from ewes' milk) goes back to the Cistercian monks at Jervaulx. These monks were noted sheep farmers and it was during their stay at Jervaulx (twelfth to sixteenth century) that some of the first stone walls and sheep folds were built for gathering the sheep during summer time for milking.

The ruins of the Cistercian abbeys in Yorkshire are some of the most beautiful in the country, and they remind us of the close link which existed between the monks and the local farmers. The dissolution of the monasteries was unpopular with Yorkshire folk in general and met with some resistance. Fortunately the method of making cheese was preserved—passed on by word of mouth and demonstration—and the blue-veined Wensleydale, rich in fat, is probably one of the oldest varieties of cheese known in England.

It continued to be made in the dales, cows gradually replacing ewes as the source of milk, but production was limited to the summer months when the Shorthorn cattle were grazing the limestone pastures. The milk was set with crude rennet, made from 'keslop' or dried calf's stomach. The cheese was pickled (i.e., cured) and salted in brine before being left to ripen. At this period cheese-making in winter was not thought possible, and any surplus milk available during the winter months was made into butter.

All the year round

Mr. Kit Calvert in his comprehensive booklet on Wensleydale cheese mentions that dry salting of the cheese was introduced into the dales by John Benson, Principal of the British Dairy Farmers' Institute, Aylesbury, during the summer of 1890–91.

Following this development, a few of the farmhouse cheese-makers made cheese all the year round, pickling it in summer and dry salting in winter. A well-made pickled blue Wensleydale was in great demand at Christmas time. The cheese was rich in fat, and the blue moulds which developed during ripening gave it the pleasant characteristic flavour which some have placed higher than Stilton.

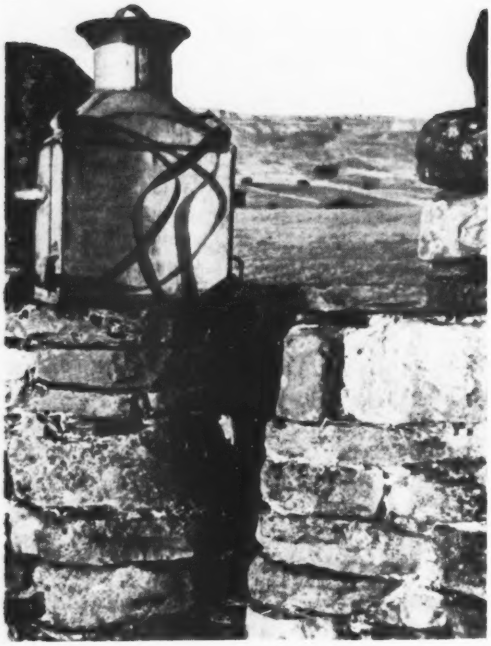
In the summer the cows were on the higher pastures; in winter they were housed in laithes or outbarns, which were often some distance apart. Milk was usually carried to the homestead in back cans. Although these are not often seen in the dales today, it is still possible to come across a farmer using one.

The farmers' wives were also very proud of the Yorkshire cheese cakes, made from curds with butter, sugar, fruit, eggs, salt and nutmeg added. Some creameries in Yorkshire still manufacture curd for sale in cartons, which carry a recipe for cheese cakes printed on the outside.

Good farmhouse cheeses could be kept for long periods. In the early days they were usually sold to local corn merchants in exchange for meal and groceries; some will still remember selling their cheese for as little as 3*d*. per lb.

Wensleydale cheese has a fairly low acidity and is especially vulnerable to undesirable bacteria and off-flavours. For these reasons it was essential to have strict cleanliness in methods of production for both milk and cheese. In spite of what would be considered today to be primitive facilities, there were some good farmhouse cheese-makers who were responsible for building up the national reputation enjoyed by Wensleydale cheese. The texture was

This old farmhouse cheese press was still in use in the 1930s



In winter, the cows were housed in laithes or outbarns and milk was usually carried to the homestead in Dales back cans

soft and flaky with a rich creamy flavour; gradual drainage of the curd and slow acid development were important factors in preventing the curd from becoming dry and crumbly; the acidity when the curd was broken and salted seldom exceeded 0·35 per cent lactic acid. The curd was lightly pressed so as to leave small air spaces within the cheese where moulds could grow to give the typical blue veining. A single bandage only was put on the outside of the cheese, a special stitch being used which gave horizontal depressions at ½-inch intervals down one side. This became a real 'trade mark' for the genuine farmhouse product.

Factory instead of farmhouse

Mr. Reg Hugill of Askrigg, who was the first farmhouse cheese grader for Wensleydale cheese, can recall that in 1934 there were 433 farmhouse cheese-makers in the Yorkshire dales. Today there are none. During the last war milk was diverted to the liquid market. The monthly cheque from the Milk Marketing Board and the simplification of the housewifes' work meant that very few producers went back into cheese-making after the war.

However, sales of factory-made Wensleydale cheese have continued to expand, due not only to the publicity given to English territorial cheeses but largely to the foresight and enterprise of several Wensleydale cheese traders and factory managers. The first factory was opened at Hawes in Upper Wensleydale in 1897; today there are five factories in the Yorkshire dales area. It is interesting to note that the manufacture of Wensleydale cheese now extends to Derbyshire, Somerset and the Welsh border, and in 1963 just over five million gallons of milk were used in factories to make this cheese. The factories make a white Wensleydale which is very mild and slightly acid in flavour. The 1 lb 'smalls' are a special feature, and it is estimated that about

a quarter of the total milk intake is made into cheese of this size. They are particularly popular for the Christmas trade.

To the dalesman, the old well-ripened farmhouse blue Wensleydale is a nostalgic memory. No doubt a wide demand for this product could be created and it would be sad if the art of making the farmhouse Wensleydale cheese is lost, but without the demand it seems unlikely that anyone will face the cost of re-equipping the farm dairies and the extra work involved in the household.

Miss Marjorie Middleton, B.Sc.(Agric.), N.D.D., is a Milk Production Adviser in the Yorkshire and Lancashire Region of the National Agricultural Advisory Service. She is a native of Wensleydale, where she was born and brought up on a farm which made Wensleydale cheese.

The Ministry's Publications

Since the list published in the January, 1965, issue of *Agriculture* (p. 31) the following publications have been issued.

MAJOR PUBLICATIONS

Bulletin No. 50. Modern Rabbit Keeping (Revised) 5*s*. (by post 5*s*. 5*d*.)
Bulletin No. 62. Bulb and Corm Production (Revised) 6*s*. 6*d*. (by post 7*s*.)
Bulletin No. 196. Cut Flowers and Foliage under Glass (New) 5*s*. 6*d*. (by post 5*s*. 11*d*.)
Plant Pathology Vol. 13 No. 4. December 1964 (New) 7*s*. 6*d*. (by post 7*s*. 10*d*.)
Experimental Husbandry No. 11. December 1964 (New) 7*s*. (by post 7*s*. 6*d*.)
Farmers' Book-keeping and Income Tax (Revised) 3*s*. (by post 3*s*. 4*d*.)

ADVISORY LEAFLETS

No. 91. Mangel Fly (Revised)
No. 110. Frit Fly (Revised)
No. 115. Slugs and Snails (Revised)
No. 295. Mastitis in Cattle (Revised)
No. 530. Virus Disease in Strawberry (New)

FARM SAFETY LEAFLETS

Obtainable free from the Ministry (Publications), Tolcarne Drive, Pinner
Lifting and Carrying
Tree Felling, Clearing and Scrubland Clearance
First Aid in Agriculture

Single copies of Advisory Leaflets, up to a maximum of six different leaflets, may be obtained free from the Ministry (Publications), Government Buildings, Tolcarne Drive, Pinner, Middlesex. Copies beyond this limit must be bought from Government Bookshops (addresses on p. 96), price 4d. each (by post 7d.). Other publications are obtainable from Government Bookshops, from Divisional Offices of the Ministry or through any bookseller.

Farming Cameo: Series 3

25. The Northern Plain, Isle of Wight

John J. S. Webster

THE Isle of Wight lies in that part of southern lowland Britain most affected by the 'Alpine Storm' and owes its most prominent topographical features to the Tertiary or Alpine series of earth movements. The diamond shape of the Island is dominated by a central ridge of chalk running from Culver Cliff, just south of Bembridge in the east, due west to form the outcropping of the Needles in the west. South of this ridge, the soils are mostly a fertile, red-brown loam, interspersed with sudden lifts of sand or gravel flats.

North of the chalk ridge is a rather flat or gently undulating plain of Oligocene Strata, which include Headon Beds, Osborne and St. Helens Beds, Bembridge Beds and the Hampstead Beds. There are large areas of Marine Gravel and Gravel terraces, especially to the north of the Hampstead Beds, the main soil formation of the northern area of the Island with which this article deals.

The type of farming carried on in this area is, in the main, dictated by the nature of the soils—though it is, of course, also influenced by climate and rainfall. Being completely surrounded by water, the climate tends to be more equable than at many parts of the mainland not far away—cooler in summer and milder in winter. Rainfall varies, but an examination of the figures for 35 years shows that in the extreme east a fall of 30 inches is the average, while only 27·5 inches fall in the western areas. As a guide the annual rainfall may be taken as between 28 and 30 inches.

The Hampstead Beds, which form by far the largest part of the area, consist of a heavy, sticky, rather acid clay soil with large gravel mixed through it. The presence of this gravel often rules out the possibility of mole drainage. This land should be under grass as much as possible, with kale or a winter corn crop grown for the odd year to clean and aerate it; then back to grass again. Climate and rainfall have affected output from this relatively fertile soil by enabling cattle to be out-wintered without suffering

many ill effects. But this practice has rather serious effects on the stocking capacity of the land. Land poached and trodden during the winter on this soil does not recover quickly in the following spring, so that total production is reduced by about one third and keep is late in consequence. Harrowing to level in the spring means more bare patches, and by the time the land is dry enough to roll in the hoof-marks, it is too late to do any good.

This was the picture of much of the farming on this area up to fifteen years ago. Such cattle as were kept in during the winter were housed in single—or double-standing 'cow stables'. Labour costs were thus high, but when the Farm Improvement Scheme became known and full advantage was taken of it, a transformation of many farms took place. Yards and parlours became the order of the day, and to the Scheme must be given the credit for more profitable farming in the area and an increase in the cattle population. Where the Gravel terraces and Marine Gravels occurred, a yard-and-parlour system enabled the same number of milk cattle to be kept and a good percentage of corn could be grown; for these Gravel terraces do grow very good crops of corn, even if the production costs in the wear and tear on ploughshares and other machinery are rather higher than on the greensands in the south.

The farming pattern in the northern plain is, therefore, dairying, linked with some pig-keeping which seems to be inherent in all Island farming. Dairy replacements are mainly home bred. The predominant breed is still Guernsey, although more and more Friesians are coming in. Even with the Channel Island premium, the Guernsey cannot compete in all-round profitability with the Friesian, with its higher milk yield and the enhanced value of its calves.

In the extreme west there is a quite large and important area formed from the Osborne Beds and Bembridge Marls intermixed with some limestone. This district—approximately some sixth of the northern plain—is farmed mostly as arable, and really excellent crops of wheat, barley, Tic beans and canning peas are grown—although this latter crop is now giving way to more beans. Farms on the whole are larger here, but a dairy is kept on most of them.

Apart from the farming aspect, the area is important to the Island's economy in that other major industries are located here, including shipbuilding at Cowes in the river Medina and a recently-introduced radar factory. The first ever Hovercraft was developed at Cowes, while a rival counterpart was built at Bembridge and known as the 'Cushioncraft'. Mention should also be made of the forests planted by the Forestry Commission, which are now beginning to produce wood and wood products. The principal forests are near Havenstreet in the east, Parkhurst in the centre and Bouldnor in the west of the plain.

The main entrances and exits to the Island are in the north. Yarmouth, in the west, takes lorries, livestock, cars and people to Lymington. Cowes, at the entrance to the river Medina, exports agricultural produce, and small motorized barges proceed down the river to Newport, mainly from Southampton. At Fishbourne and Ryde there are ferries to Portsmouth. It must be remembered that, next to agriculture, the chief industry is tourism, and these ferries provide the entrance for the holiday-makers who consume the Island's produce, whether it be early potatoes, tomatoes, strawberries and the milk, butter and cream to go with them.

J. F. HOARE
Agricultural Land Service, Nottingham

Bustards, Feasaunts and Hares

OVER 130 years ago—in 1831—there was passed an Act 'to amend the laws in England relative to game'. There was nothing very unusual about it—twenty pages, forty-eight sections and two schedules—except that it repealed no fewer than twenty-seven earlier statutes going back as far as Richard II's reign and including those dealing with 'the taking of Feasaunts and Partridges' (Henry VII), 'cross bows and hand guns' (Henry VIII), 'untimely hawking' (James I), 'preservation of heath fowl' (George III) and many others.

It might be supposed that such a comprehensive piece of legislation would save any further statutory control for years to come, yet before the end of the century seven further Acts were deemed necessary. Two dealt with poaching, two with gun and game licences, one with ground game and two with hares. One of the last, incidentally, must have created nearly a statutory record, consisting of barely a page and only five brief sections, making it unlawful to sell or expose for sale any hare or leveret between March 1st and July 31st in every year—not unexpectedly being titled the Hares' Preservation Act.

Some years were then to elapse after the nineteenth century spate of game control, until the Agricultural Holdings Act 1908 which provided for a tenant's entitlement to compensation from his landlord for damage caused by game, where the landlord exercised the sporting rights—a principle later reaffirmed in the 1923 and 1948 Acts. Even more recently there have been three further Acts, dealing with the protection of certain birds (1954), gin traps and the like (1954), and the most recent one, in 1963, with deer preservation.

One intriguing feature of this welter of 130 years of game legislation is the variable definitions of 'game' found in many of the Acts. Originally, for example, the 1831 Act included pheasant, partridge, grouse, heath or moor game, black game and bustards. Hares were included but not rabbits. The Game Licence Act (1860) included these, and added woodcock, snipe, quail or landrail, conies and deer as well. Twenty years later hares and

rabbits were virtually reclassified as ground game by an Act of that name in 1880. Game in the 1948 Act, however, includes only deer, pheasant, partridge, grouse or black game, at least for the purpose of claims for damage by a tenant.

The reasons for these variable definitions are mainly of academic (or legal) interest, for there is not one farmer in a hundred who becomes legally involved due to a misinterpretation of the word 'game'. On the other hand, there is often doubt as to when a game or a gun licence is required, what can be shot at—and when—and by whom.

Generally speaking, every farmer who carries and uses a gun should have either a gun of a game licence, unless he uses it solely for scaring birds or killing vermin on his own land. If game is 'taken, killed, of pursued', then the user of the gun *must* have a game licence. However, if only ground game (i.e., rabbits and hares) is taken on his own land, a gun licence is all that is needed. Unfortunately, some farmers firmly believe that, provided they shoot only on their own land, no licence is required at all—a mistake which can prove expensive in the Courts, when a 10*s*. gun licence or a £3, £2 or even a £1 game licence (depending on the length of the season) would save their pockets, time and reputations. Similarly, whilst the various game seasons are widely known, shooting has been known to take place, contrary to the law, on Sundays and on Christmas Day even. This has probably occurred more often than killing ground game by shooting 'between the end of the first hour after sunset and the beginning of the last hour before sunrise'. The penalty? A fine of up to £2.

So far, no legal differentiation has been made between the owner-occupier and the tenant. At common law, if the tenancy agreement does not mention the matter, it is the tenant who has the right to take game, and it is for this reason that a landlord needs to reserve the rights, if he wishes to exercise them, in any agreement between him and his tenant. The use of the word 'reserve' entitles the landlord to the sporting rights, except for the ground game which remain the tenant's right to take.

On the subject of damage by game, the law since 1908 has recognized that the absence of control by the tenant over his landlord's game can result in damage for which the tenant should be entitled to compensation, a principle reaffirmed in the Agricultural Holdings Act 1948. There are many conditions involved before a successful claim can be substantiated—the damage must have been caused only by deer, pheasant, partridge, grouse or black game—only to growing or reaped crops—in excess of 1*s*. per acre of the actual area over which the damage extends, and so on. Exactly how often such claims are submitted is not known but it is suspected they are very rare. Both private landlords and estates realize only too well that the maintenance of a good shoot depends substantially on the co-operation of tenants, and mutual arrangements are generally made without any recourse to law: nevertheless Section 14 of the 1948 Act is available for use by the tenant if all else fails.

In a short article, only a few aspects of game law can be dealt with. It is an intriguing subject, and some basic knowledge is obviously desirable for any farmer who shoots regularly or even occasionally. But even an extensive knowledge of it provides no compensation for an ounce of No. 6 shot in the leg or the face through a faulty or unsafe gun, or one that is badly handled.

IN BRIEF

Calf Shortage

Speaking at the Oxford Farming Conference last month *Mr. H. R. Neilson*, of Leamington, touched on the question of calf shortage in relation to future beef supplies. He wondered what policy might be devised to bring about a national dairy calving interval of 12 months.

'We are, of course, dealing with a problem not fully under the control of man', he said, 'but an average calving interval of 13 months does mean that many calving intervals must be greatly in excess of this period, and this is where the problem might be tackled with the greatest hope of success.

'The much publicized calf shortage is not just a problem of calving intervals. It is partly a problem of seasonality, as the dairy calf supply drops decisively from April to August. Intensive feeding, on the other hand, often, although certainly not necessarily, using highly capitalized buildings, requires a regular 12 months throughout.

'How may these conflicting demands be met? Fortunately, dairy calvings in July and August appear to be on the increase, but that still leaves a long gap in the summer months. Should the intensive feeding units take in calves from more traditional rearing patterns for that period? Or dare one hope that in the years to come our scientists will perfect ova transplantation in cattle so that areas, such as parts of Wales, might house specialized breeding units, employing twinning and ova transplantation to gain maximum calf production.

'The dams would not be expected to produce milk, two calves a year being their sole reason for living. They could be selected simply on what is described as good 'maternal environment' plus longevity. Expert stockmen might be 'imported' from other parts of the country for the summer period to supervise calving and conception. The progeny, finished on the barley beef system between the peak market price months of January to May, should earn good rewards for these specialized breeding units.

'If we may keep our feet more on the ground of the present and our heads less in the clouds of the future, our greatest concern in promoting calf supplies today must be to reduce the appalling figure of 20 per cent dairy calf mortality. The full resources of research facilities and the advisory services, coupled with the spread of good present-day management techniques must be brought to bear on this problem, which involves breeding, nutrition, hygiene, disease, housing and, if applicable, transport.'

UK—USSR Agricultural Research

An agreement on the future co-operation in agricultural research between the United Kingdom and the U.S.S.R. was signed in London on January 6th by the Minister of Agriculture, Fisheries and Food, the Rt. Hon. Frederick Peart, M.P., and the Soviet Ambassador, His Excellency Alexander Soldatov.

The agreement, which runs for five years, initially, provides for

- exchange of information and, as appropriate, of scientific material and visits between scientists and institutions of the two countries on some 61 specified research topics under seven general headings—crop production, soil science, plant protection, livestock production, veterinary science, farm mechanization, and water economy;
- exchange of scientific delegations in 1965;
- designated 'co-ordinating centres' in each country;
- a further meeting of experts in London in six months' time, and thereafter annual meetings, to keep the working of the agreement under review.

Milk Production is a Complex Business

—says A. J. Wynne, Agricultural Economist, Leeds University.

The most important economic factor in milk production is the output of milk per cow per year. This is not necessarily the same as the recorded yield of the herd, which can be, and often is, a most misleading figure. Milk yield per cow per year is the yield found by dividing the total yearly production by the average number of cows in the herd during the year. This takes into account the heifers whose yields are not as good as expected, the cows that fail to breed or only calve every fifteen months, as well as the better cows, and gives a realistic measure of what the whole herd is producing.

Together with yield the level of concentrate feeding should be considered. These two factors between them are responsible for about half the total variation in profits found in dairy herds. As yields go up, so do profits (assuming a constant level of management). And at each level of yield the profit goes up as concentrate feeding goes down, and vice versa. These are the most important items to look at. If they are unsatisfactory you may need to seek advice from the husbandry expert on how to improve yields and from the nutrition expert on more economical use of feedingstuffs. It is worth emphasizing that getting a good yield depends as much on the regularity and consistency with which the cows produce milk as it does on the lactation yields of the best cows. The quality of cowmanship can have a big effect on output, and becomes of great importance when a movement is made away from easily rationed compound cakes towards greater reliance on home-grown fodder and grazing.

Other important factors affecting profits are the production of fodder and pasture management, and herd replacement costs. There is plenty of evidence to show that low output from pastures and meadows is a weak point on many dairy farms (including many that also grow excellent leys). It is impossible to obtain a good margin, necessary to cover fixed or overhead costs, from any field with a low output and such fields pull down the overall profit as well as causing the profit from the dairy herd to be spread more thinly over a bigger area, giving lower profits per acre. Conversely, those who obtain a good yield of home-grown fodder can release part of the land for cropping, or build up a reserve against a bad season. Naturally the food produced should be used efficiently. This means not only the avoidance of waste but also the skilful use of the foods in order to minimize costs while maintaining yields.

Herd replacement costs are perhaps the most difficult to assess because they vary so much from year to year and are affected by the method of valuation used. This is a major item on only a few farms and does not vary much with breed. Income from calves, however, can materially affect results, and Friesians come out well in any breed comparison. Apart from variations in the value of calves, there is a surprising variation in the number of calves actually reared or sold. Many herds produce only four calves, or less, from five cows, and often a proportion of the calves are of poor quality. This is another item easily checked, and any improvement will be well rewarded.

It has been found that the most successful milk producers have an all-round excellence. They may be particularly good in one direction, high yields perhaps, or high production from grass, but when their costs are analysed it is found that there are few weak spots and no bad ones. Usually they are good all round—in yield, feeding, fodder production, labour and so on. Profitable milk production depends on being skilled in all aspects of the job in order to realize the full potential of both stock and land. There is no short cut.

Electrical Research Change

The Field Station at Shinfield, near Reading, which has been operated by the Electrical Research Association for the last twenty years, has been transferred to Reading University, on whose land the Field Station is situated. The Electrical Research Association is making a gift of all the equipment to Reading University, and the E.R.A. staff is now employed by the University.

The research previously carried out at Shinfield by E.R.A. will be continued by Reading University, under the guidance of an Advisory Committee to be set up by the University. Nominations of persons to be included on this Committee include representatives of the Electricity Council and Mr. E. W. Golding, an Assistant Director of the Electrical Research Association, who was Head of the Rural Electrification Department.

By arrangement with Reading University, the Electrical Research Association will remain in close touch with the work of the Field Station, which is of the greatest interest to its members.

Officially Approved Chemicals

The 1965 List of products approved for use by farmers and growers under the Agricultural Chemicals Approval Scheme is now available. It contains details of some 660 products based on more than 100 chemicals or mixtures of chemicals used for pest, disease and weed control.

The introduction includes a reminder about the restrictions now placed on the use of certain persistent organochlorine compounds. The List only includes uses of products containing aldrin, dieldrin, endosulfan, and endrin which may continue.

The List gives farmers and growers a wide choice of officially approved chemicals and the introductory pages also include hints on the safe handling of chemicals and the names of those which require special precautions in use. Under each chemical appear the principal pests, diseases and weeds controlled and the crops which may be treated.

Approved products can be recognized by the 'A' mark (reproduced on page 96) on their labels and containers. Farmers and growers should, in their own interests, consult the List and make certain that they use only officially approved products. Copies may be obtained, free, from any Regional or Divisional Office of the Ministry or from Publications Branch, Tolcarne Drive, Pinner, Middlesex.

Details of products approved since the 1965 List went to press are given on page 96. Further additions to the List will be announced from time to time by press notices and will also be published in *Agriculture*.

Books

The Journal of Applied Ecology. Edited for the British Ecological Society by A. H. Bunting and V. C. Wynne-Edwards. Blackwell Scientific Publications. 70*s*.

The birth of *The Journal of Applied Ecology* is to be welcomed. In style, layout and high standard of production it is similar to its elder brothers, the *Journals of Ecology* and of *Animal Ecology*. Clearly many studies in well-established fields of applied biology utilize ecological ideas and methods, and the results could appropriately be published in this new journal. However, the Editors are especially interested in receiving papers dealing with ecological aspects of the conservation, management, control and development of natural resources throughout the world. At a time when general interest and appreciation of these subjects is growing rapidly, the appearance of this new journal is most opportune.

The first issue contains sixteen papers, of which half are devoted to botanical subjects including clover swards in South Australia, water relations in pine plantations in Berkshire and the distribution of strontium 90 fallout among three types of vegetation in the U.S.A. Zoological topics include honeybee behaviour, control of chironomid midge larvae, effects of predators on populations of red grouse and the growth and reproduction of an American bivalve mollusc in British waters.

One of the four papers from overseas gives a fascinating account of how porcupine populations may have fluctuated in a National Park in Colorado over the past 275 years. Porcupines, whilst feeding, cause permanent scarring to trees, and it was possible to determine the year in which a scar was made by examining the growth rings. The frequency distribution of damage was cyclical, with eight peaks in nearly three centuries, and it is concluded that these peaks coincided with population eruptions.

The British Ecological Society is to be congratulated in sponsoring a third journal which seems destined to occupy a valuable niche. Applied ecology is an expanding subject and the Editors should have no difficulty in obtaining a steady supply of stimulating papers for publication in future issues.

Publication of *The Journal of Applied Ecology* is twice a year: annual subscription £6.

A.R.M-B.

Pests of Field Crops. F. G. W. Jones and Margaret Jones. Arnold. 50*s*.

We now have a comprehensive text-book for this subject which is up to date. It contains a properly balanced account of all British field crop pests. There is valuable, but not undue, emphasis on nematodes, and adequate discussion of mammals, birds and molluscs.

This book is very good value for money. Its price compares favourably with the 80*s*. charged for *Principles of Agricultural Entomology*, by Edwards and Heath, recently published by Chapman and Hall. Jones and Jones contains only 12 pages fewer. Its format is less modern than that of its rival, but in compensation its more condensed type gives more words per page. Moreover, because the style is concise, there is more information about insects in Jones and Jones than in its rival, although fewer pages are devoted to insects.

The work is a product of the extensive experience of F. G. W. Jones, who taught this subject at Cambridge until 1956, and then left it for the narrower field of nematological research. It is documented with 500 references (which were found to be quoted in the text); 89 per cent of them are to papers published in or after 1950, and 38 per cent to those published in 1960–63. This demonstrates both the growth of recent knowledge in the subject, and the authors' competence in respect of this new information. (Edwards and Heath contains 325 references, two-thirds of which are post-1950.)

There are many illustrations, including two useful colour plates of slugs, reprinted from the *Journal of Animal Ecology*. Some of the line drawings contain much unnecessary systematic detail, but it is not a serious fault if a book provides too much information: necessary information is not omitted.

A surprising feature of the book is that it launches a new popular nomenclature for

nematodes. Without any discussion, potato root eelworm is renamed as potato cyst nematode, and so on. Moreover, the change seems to have been effected while the book was being written, and so sometimes an eelworm will be referred to by its customary common name, sometimes by the new one, and sometimes by its Latin name. This inconsistency will tend to confuse readers; it has evidently already confused the person who compiled the index. This lists six pages on which reference is made to 'eelworm, stem'; eight (seven of which are different from these six) on which 'stem and bulb nematode' is mentioned; and nine (only four of which are included under the former headings) referring to '*Ditylenchus dipsaci*'! Therefore, to find all the information about any pest, one has to search the index under its Latin name, its common English name and, in the case of nematodes, also under the new names coined by F. G. W. Jones. This is a grievous fault in a book which is designed to be a work of reference and, until it is remedied, it would be appropriate if the publishers inserted a slip in future copies to warn readers of this hazard. Edwards and Heath is also without cross references.

C.R.R.

Introduction to Soil Science. G. W. Leeper. Melbourne University Press. 35*s*.

Written by the Professor of Agricultural Chemistry in Melbourne University, this book is a simple and clear account of basic soil science; it is pleasant to read and holds the interest. Most of the illustrations and data quoted are from Australian sources. This may be a hindrance to the wider use that the book merits, as many students prefer such material to refer to soils and situations they know.

There are four parts. The first, on mapping, classification and formation of soil, reflects the author's clear thinking and perception on these vexed subjects. He points out that a generally satisfactory answer for classifying the world's soils has not appeared 'and is unlikely ever to appear, nor is this a matter for lament'. He shows the usefulness of a factual classification now being developed in Australia which takes particular account of the actual soil properties observed and less of existing systems in other countries.

Part II, describing important aspects of soil physics, is particularly helpful for clear explanations about water relationships. The simple account of soil chemistry in Part III, though useful, is not sufficient for understanding nutrient cycles in soils and crops under British conditions, nor for making decisions on fertilizer used here. Part IV is a brief, but good description of soil erosion.

Because of its clear critical approach, this book will be of value for most students as a supplement to any local text they may use—especially the section on soil classification and formation. The author says the work was designed for teachers in general science. This recommendation is endorsed; it will also be valuable to other teachers in agricultural science, and, as a 'second' text on soils, to students taking certificate, diploma and degree courses in agriculture. With its vigorous Australian background, it will help these readers to understand soils better and to widen their outlook.

G.W.C.

Old English Towns. F. R. Banks. Batsford. 25*s*.

Mr. Banks has already written a charming and informative book about English villages. In this companion volume he deals with 400 or so of England's towns. First he traces the course of urban development in England, from Roman times to the present day. This historical approach is maintained in the town-by-town survey that forms the major part of the book. The result is not so much a guide-book as an illuminating account of how and why our towns have grown through the centuries to assume the patterns and characteristics they have today.

Edwin Smith's delightful photographs, used as illustrations, are a welcome reminder that beauty, grandeur, dignity and numerous visual links with earlier modes of life are still to be found almost everywhere, despite the creeping uniformity now being imposed by the property developer—provided one is prepared to explore on foot beyond the new supermarkets and office blocks.

The book is not intended to be comprehensive. There are more than 850 towns in England, most of which were founded sufficiently long ago to qualify as 'old', but in the limited space available not all could be included. Some of the absentees—Long Melford and Lavenham, Burford and Dunster, for instance—are to be found in the author's earlier book *English Villages*. Indeed, few of the chosen towns are allotted more than one page of text. Even so, there

is a surprisingly large amount of interesting information.

The book is well arranged for easy reference. The towns are dealt with on a regional basis and there is a map showing how the counties are grouped into nine regions. Towns mentioned are listed under counties in one appendix and alphabetically in another. This is a book to take in the car on any journey not wholly devoted to getting from A to B without loitering *en route*. Equally, it is a book for the armchair traveller, guaranteed to whet the appetite for future expeditions and, perhaps, to provoke nostalgia for places once familiar and now seldom seen.

S.L.

High Energy Diets for Poultry. W. O. BROWN. U.S. Feed Grains Council.

The subject matter is covered in seven sections: the concept of high energy diets for poultry; methods of determining energy values of poultry foods; factors affecting the energy value of poultry foods; relationship of energy content of the diet to other nutrients present; efficiency of utilization of diets of different energy content; composition of mixed diets of high energy content for various classes of poultry; and conclusions and appraisal of high energy diets. Some 100 references are listed by author and journal, but the titles are not given.

There is a real need for a publication of this sort to get into perspective the thorny problem of so-called high energy diets. Unfortunately the energy level of a compound food, one of the most important factors in relation to food consumption, does not have to be declared under the Fertilisers and Feedingstuffs Act. Anyone can therefore call a diet 'high energy' but one is left with the nasty question in one's mind 'high in relation to what?'

Dr. Brown's booklet contains a great deal of valuable information and opinion, and those who are well acquainted with the subject can find what they want. Unfortunately the style is rather rambling and some of the arguments are not at all easy to follow. Consequently those who really need the book, namely those with very little knowledge of the subject, will not get the benefit which its publishers intended.

There is the curious case of the asterisk in the title of Table 5, which is related apparently to nothing as it gets no further mention. One is left to assume that this table should have had the same asterisk and footnote as Table 3.

It is refreshing to note the reference to the unsuitability of Kellner's classical ruminant-derived starch equivalent values for poultry feeding. But one would welcome a clearer support for the use of metabolizable energy rather than the productive energy of Fraps, as the latter values are applicable only to growing chicks from day-old to fourteen days.

Copies of the booklet can be obtained, free, from the U.S. Feed Grains Council, Locomotive House, 30/34 Buckingham Gate, London, S.W.1.

W.M.A.

Experimental Farm Buildings Scheme, Report No. 2—Light and Heat in a Large-Span Glasshouse. AGRICULTURAL RESEARCH COUNCIL. H.M. Stationery Office. 2*s*. 6*d*. (by post 3*s*.).

The Agricultural Research Council has carried out an investigation under the Experimental Farm Buildings Scheme to assess the performance of a large-span glasshouse oriented east-west.

The glasshouse studied was of a new type, with a clear span structure, 328 ft long, 60 ft wide, 22 ft high at the ridge and 7 ft 6 in. high at the eaves. It was found that the east-west orientation of the house allowed more even transmission of direct solar radiation in winter compared with a north-south orientation.

The roof was supported by trusses instead of purlin posts, thus giving a clear floor area, and this appeared to result in very little loss of transmitted radiation. In fact, the glass caused a greater loss of radiation than the structure, so that further improvements in the design of the structure would have only a small effect on the amount of radiation received in the house.

The centre received slightly more diffuse radiation than the areas near the sides of the house. To give minimum interference to transmission of direct radiation in an east-west orientated house, wall ventilators should, therefore, be placed only in the north wall.

Records of night temperature distribution showed that horizontal distribution appeared more uniform than in a multi-span house; vertical temperature differences were negligible.

A single-span house is likely to cost nearly the same as a multi-span house of the same area and materials.

In the first two years the house tended to give heavier crops of tomatoes than traditional glasshouses on the same site, despite difficulties with soil structure and disease.

E.D.

Agricultural Chemicals Approval Scheme

Since the 1965 List went to press, the following products have been approved:

HERBICIDES

2, 4- DB with MCPA
Potassium and Sodium Salt Formulations
Cornox 2, 4-DB Plus—Boots Pure Drug Co. Ltd.

DICHLORPROP with 2, 4-D
Amine Salt Formulations
Mirvale 2 : 4 D.P + 2 : 4D—Mirvale Chemical Co. Ltd.

DICHLORPROP with MCPA
Potassium and Sodium Salt Formulations
Cornox R K extra—Boots Pure Drug Co. Ltd.

IOXYNIL FORMULATIONS
Ioxynil is a new weed-killer of mainly contact action particularly effective for control of may-weeds in cereals. It is being marketed in mixtures with dichlorprop, MCPA and mecoprop, providing in addition, control of weeds for which these latter chemicals are effective.

IOXYNIL with DICHLORPROP
Potassium Salt Formulations
Certrol—P—A. H. Marks & Co. Ltd.

IOXYNIL with MCPA
Sodium Salt Formulations
Actril A—May and Baker Ltd.

IOXYNIL with MECOPROP
Sodium Salt Formulations
Actril P—May and Baker Ltd.

MCPB with MCPA
Potassium and Sodium Salt Formulations
Cornox MCPB Plus—Boots Pure Drug Co. Ltd.

MECOPROP
Potassium and Sodium Salt Formulations
'Top Crop' CMPP—Soil Fertility Ltd.

MECOPROP with 2, 4-D
Amine Salt Formulations
Iso-Cornox Plus—Boots Pure Drug Co. Ltd.

PROMETRYNE with SIMAZINE
A mixture of weed-killers combining soil action with foliar action for use up to the time of crop emergence in potatoes.
Wettable Powder Formulations
Camparol—Fisons Pest Control Ltd.

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